目　次

1 はじめに

Introduction

1. はじめに：「現場立脚」と「俯瞰的視野」の統合のための試行 / Introduction: Trial and error for the integration of 'field-oriented' and 'broader viewpoint' programs

2008年1月に振興調整費「戦略的環境リーダー育成拠点形成」の公募がはじまり、本学でも申請に向けた準備が始まった。当時の有馬学部長、笹尾理事から申請に向けてのとりまとめを仰せつかった。農学府の同年代の教員で何度もブレインストーミング的な会合を持ち、どのようなコンセプトのプログラムを作るかを話し合った。「日本ではじめの環境の学科」、「国際的開発人材育成」、「フィールドに立脚した」、「車座プロジェクト」、等々、いろいろな意見やアイディアが出た。最終的には「現場立脚」でいこうということで、現在のプログラムに落ち着いていった。

そもそも、何故「現場立脚」と考えたのか？私自身は環境汚染の研究が専門である。その中で、アジアの環境汚染を扱ってきた（現在ではこのプログラムのおかげで、アフリカへも展開している）。科研費の海外学術調査でよくアジアのフィールドへ調査に出ているが、いつも現地でのサンプリングやサンプル処理の手伝いで学生さんに同行してもらっている。こちらとしてはあくまで研究の補助で来てもらっているのだが、アジアの環境汚染が問題になっているような地域に調査に同行することは、学生さんの教育上大きな効果があることが、何回か調査を行ううちにわかってきた。ヘドロだらけの運河で手漕ぎボートで採泥したり、悪臭漂いゴミが燃えている炎天下のゴミ埋立地で浸出水を採水したり、クラクションの洪水の中バイクタクシーにひかれそうになりながら道路粉塵を採取する、等々、環境問題の現場を五感をもって体験することが、環境問題の理解にとっては大きな意味を持つ。就職活動の面接で、海外調査への同行を語り、職を得たものまでいる。アジア・アフリカの現場体験は貴重な人材育成の場である。しかし、科研費は、研究が目的なので、そのような教育的効果を語れなかった。そこで、「環境リーダー育成拠点形成」に、「現場立脚」を導入しようと考えた。

「現場」は大事であるが、現場に通うだけで「リーダー」になれるのか？そもそも「リーダー」には何か必要なのか？これも申請前のブレインストーミングでよく議論した。リーダーの一つの重要な要件は「俯瞰的な視点」である。では、「現場」と「俯瞰的な視野」と」いう一見すると対極にあるものをどうつなぐ？この課題への答えの一つが「ポストフィールド報告会」である。申請書には「海外フィールド実習終了後にポストフィールドレポート報告会で様々なフィールドで実習を行った学生間でディスカッションを行い、お互いが得た情報・試料や地域固有の環境問題を相互比較する。多様な個別の事例の相互比較から、アジア・アフリカ地域に共通する問題とそれぞれの地域での特殊な側面を抽出することができる。」と書いた。セミナー形式で、他のフィールドの理解や他の研究分野の学生と議論をすることにより、それぞれの現象と場の立体的な連関を理解して、それが俯瞰的な視野の育成につながる、というわけである。申請書的には、なるほどという企画である。

しかし、書くと実行するでは大違いであった。いざ、「ポストフィールド報告会」で議論しようとしても、まずは個々の学生さんの専門分野が異なり、議論がかみ合わない。我々研究者レベルであっても、異分野の交流は難しく、専門用語を理解しあうことから始める。それを、研究の駆け出しの連中に求めるのに無理があったようだ。まして、日本人の学生さんにとっては異分野の内容を英語で話されても、議論どころではない、というのがはじめの状態だった。しかし、特任教員のみなさんの知恵と努力で、回を重ねるごとに異分野の学生間の議論ができるようになってきた。とはいえ、まだまだ理想には遠いものである。これからも続ければ、きっと理想に近づいていくはずである。もちろん、本学の「現場立脚型環境リーダー育成プログラム」には「ポストフィールド報告会」以外にも様々な企画があり、いずれもプログラムを進める中で、進化

してきた。本報告書を通して、それぞれのカリキュラム・企画が試行錯誤の中でどのように進化してきて、どのような方向に向かっているのかを理解していただければ幸いである。

プログラムの遂行にあたっては学内外の多くの皆様に大変にお世話になりました。この場をお借りして、御礼申し上げます。

2014 年 3 月　環境リーダー育成センター長　高田秀重

A Special Coordination Funds for Promoting Science and Technology program, “International Environment Leaders Training Program,” started accepting applications in January 2008, and preparation for the application procedures began at TUAT as well as at other institutions. I was appointed to coordinate the preparation for applications by Prof. Arima and Prof. Sasao, the then dean and then trustee, respectively, of TUAT. I had discussions with my peers at the Graduate School of Agriculture, and brainstormed ideas for the concept of the program that we were going to develop. We came up with various ideas and suggestions, including: “the first department in Japan focusing on a new field of environmental study,” “international development of human-resource training,” “field-oriented studies,” and a “sitting-in-a-circle project.” Finally, “field-oriented studies” was chosen and developed into the current program.

Where did the idea of “field-oriented studies” come from in first place? My research area is environmental pollution. Specifically, I have been studying environmental pollution in Asia, (and thanks to the program, my research interest is expanding to include Africa.) I often go on field trips to Asian countries as part of international surveys, funded by Grant-in-Aid for Scientific Research, with students who assist with on-site sampling and sample preparation. While the main role of the students is to assist research, after several field trips abroad I came to realize that participating in surveys in areas where environmental pollution is serious has a significant educational effect on the students themselves. To understand environmental issues, it is important for students to experience, firsthand, conditions at actual sites that have environmental problems using their own five senses, such as by sampling mud from aboard a rowboat in a sludge-filled canal; sampling leachate under the blazing sun at a landfill that is smelly and which has burning garbage; and collecting road dust on a street full of honking vehicles while busily avoiding getting hit by motorcycle taxis. One student during a job interview talked about an overseas field trip in which he had participated, which led him to getting the job. Field experience in Asia and Africa give precious opportunities for human resource training. However, this educational effect has not previously been mentioned because the main purpose of Grant-in-Aid for Scientific Research is research. Therefore, we decided to incorporate the concept of “field-oriented studies” into “the education program for leaders in environmental sectors.”

While it is clear that “field” is important, can anyone become a leader just by going into the field? In the first place, what are the requirements for leaders? We discussed this in the brainstorming sessions before we filed the application. One of the essential requirements for a leader is to have a broad viewpoint. So how can we connect the “field” and “broader viewpoint,” which do not necessarily seem to be complementary? One answer to this question is a “Post-Field Reporting Seminar.” In the application form, I wrote, “after taking part in international fieldwork, students will participate in discussions at a Post-Field Reporting Seminar with other students who participated in fieldwork at different sites, giving them the opportunity to compare data, samples, and other region-specific environmental problems that they experienced through the fieldwork. By comparing diverse cases, issues that are common in Asia and Africa, and problems that are unique to a specific region can be identified.” Understanding the topics of other fields of study in

the context of a seminar and having discussions with students from other disciplines promotes the development of a broader viewpoint through the understanding of the relationship between phenomena and places from different angles. And this, at least on the application form, seemed to make sense.

However, it turned out that there was a great difference between writing and doing. In the discussion at the Post-Field Reporting Seminar, students were on different wavelengths because of the differences in their specialized areas. Exchanges among different fields are difficult, even for experienced researchers. We need to begin by understanding the terminologies of other fields. We may have expected too much from fledgling researchers. Furthermore, especially at the beginning, listening to unfamiliar topics in English itself is difficult enough for Japanese students, let alone discussing issues. However, thanks to the hard work and advice of specially appointed professors, discussions among students from different fields have been shaping up at each session. And while it is still far from ideal; if we continue, we should be able to achieve the ideal. The TUAT's Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa has a number of different projects in addition to the post-field reporting seminar, all of which have been developing in the process of operating the program. I will be happy if this report proves helpful to you in understanding how each curriculum and project have developed during the process of trial and error, and in what direction they are heading.

I would like to thank all the persons on- and off-campus for their assistance and hard work in undertaking the program.

Hideshige Takada,
Director, FOLENS
March 2014

2 FOLENSとは

What is FOLENS?

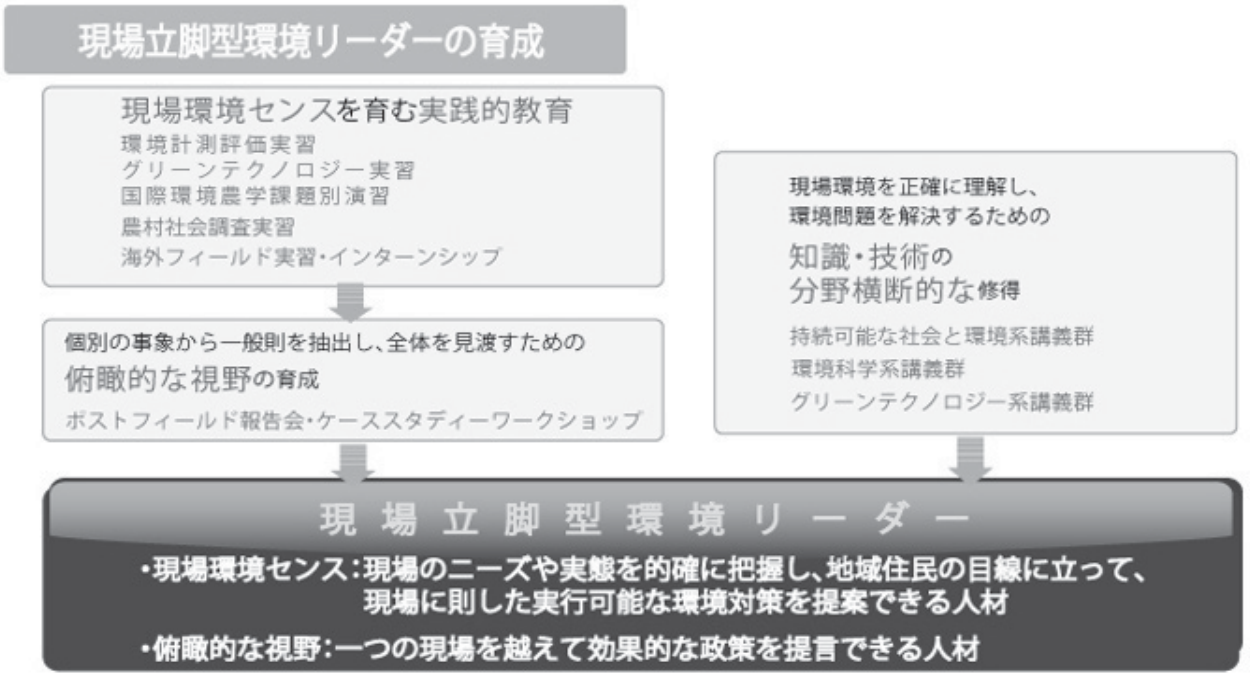
2. FOLENS とは / What is FOLENS?

東京農工大学では、アジア・アフリカ地域で活躍する環境分野リーダーの育成を目指す大学院教育の構築（正式事業名「現場立脚型環境リーダー育成拠点形成（Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa= FOLENS：フォレンス）」を、平成 21 年度から実施しました。このプログラムは、平成 21 年度文部科学省科学技術振興調整費「戦略的環境リーダー育成拠点形成事業」の採択を受け開始され、平成 26 年度以降は学内の独自措置にて継続されます。

FOLENS が育成する「現場立脚型環境リーダー」とは、現場で地域の住民と共に汗を流し泥にまみれながら、十分な知識に基づいて現場の問題を的確に把握し、技術と広い視野を持って、実効性の高い環境対策・政策を提言し、実現できる人材です。

このような人材を、東京農工大学大学院の全組織（農学府、工学府、連合農学研究科等）に横断的に設けた「アジア・アフリカ現場立脚型環境リーダー育成プログラム（FOLENS プログラム）」（修士・博士課程および 1 年間の短期プログラム）で養成します。プログラムでは、自然科学、社会科学両分野の講義に加え、フィールド実習やインターンシップ等、実践的な学びの場を提供します。また、日本人学生とアジア・アフリカ地域からの留学生が、多様な視点から意見を交換しあい、国際的な広い視野から環境問題を捉えることのできる環境をつくります。全ての講義は、英語で行われます。

FOLENS の運営は、「環境リーダー育成センター」が担っています。また、タイ、マレーシア、ベトナム、ガーナ、中国に「コーディネーターオフィス」や「教育・研究拠点」を設置してきました。

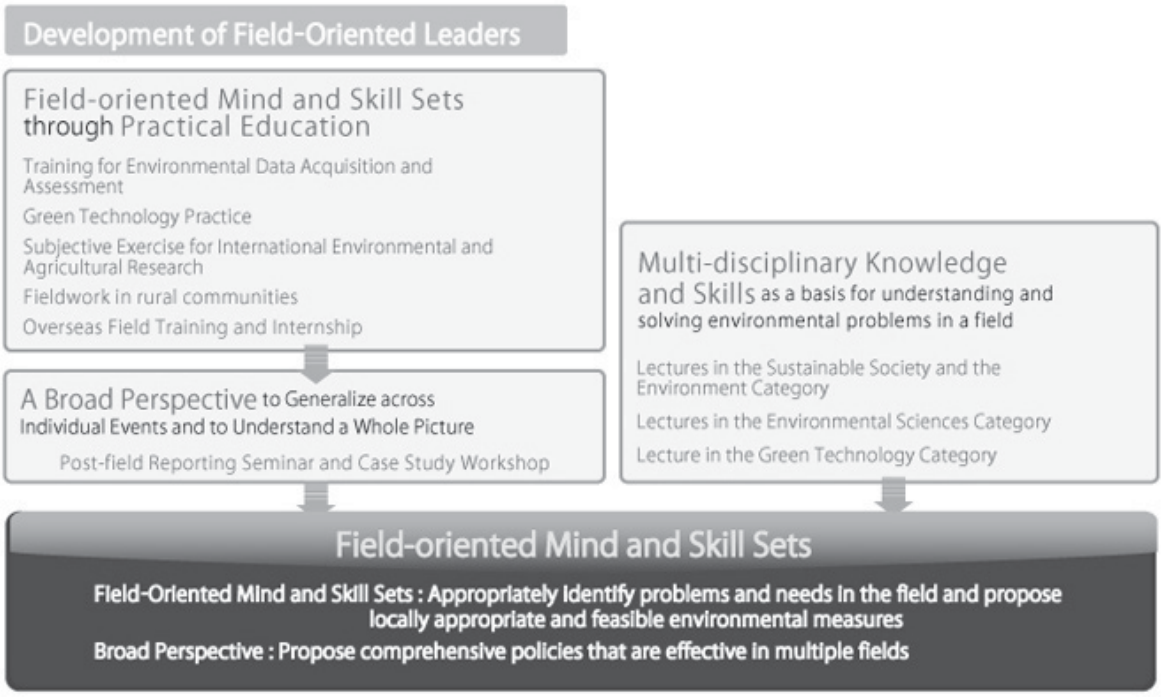


"FOLENS," or the Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa, is a special program for postgraduate students at Tokyo University of Agriculture and Technology (TUAT). It offers a curriculum that trains students to serve as leaders with "field-oriented" mind and skill sets to be able to identify environmental issues and to propose effective measures for achieving sustainable development while working in cooperation with local stakeholders in Asia and Africa.

The FOLENS curriculum consists of practical training through field study and/or internships as well as lectures on environment-related natural and social science issues. Students from Japan and abroad, particularly Asia and Africa, will come together to share various viewpoints and nurture an international perspective. All of the classes are conducted in English.

The principal organization operating the FOLENS program is FOLENS Headquarters, established in TUAT in June 2009. FOLENS Coordinator Offices and Education & Research Bases have been set up in Thailand, Malaysia, Vietnam, and Ghana.

FOLENS has been supported by a Special Coordination Fund for Promoting Science and Technology from the Ministry of Education, Culture, Sports, Science, and Technology, Japan. It will independently be operated by TUAT after April 2014.

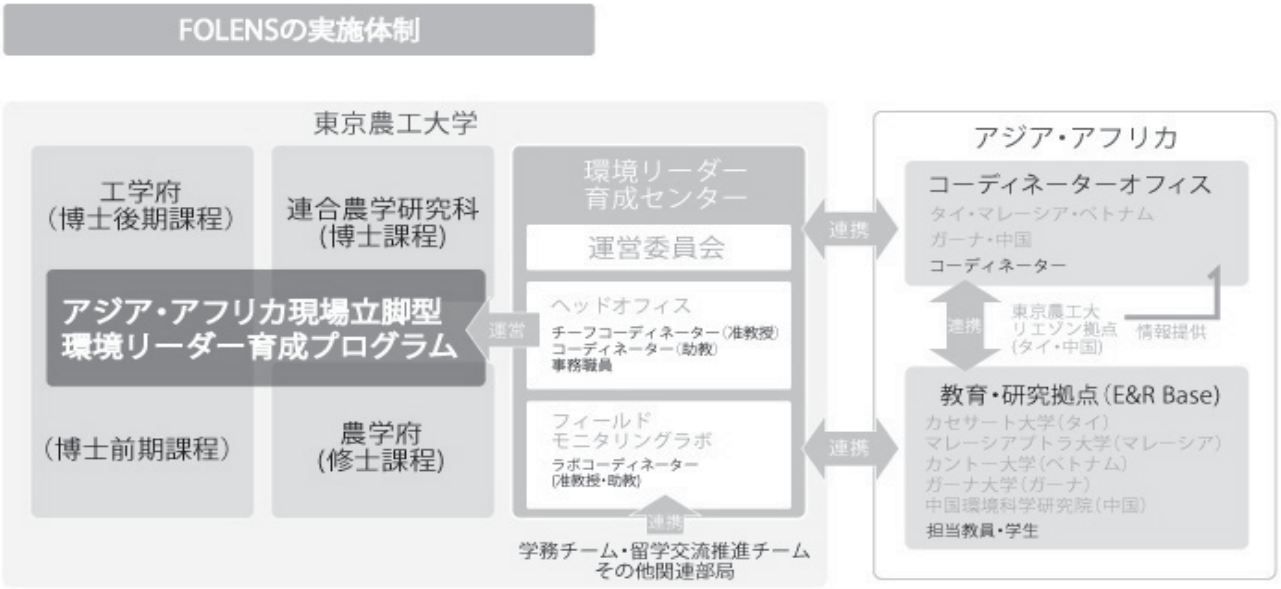


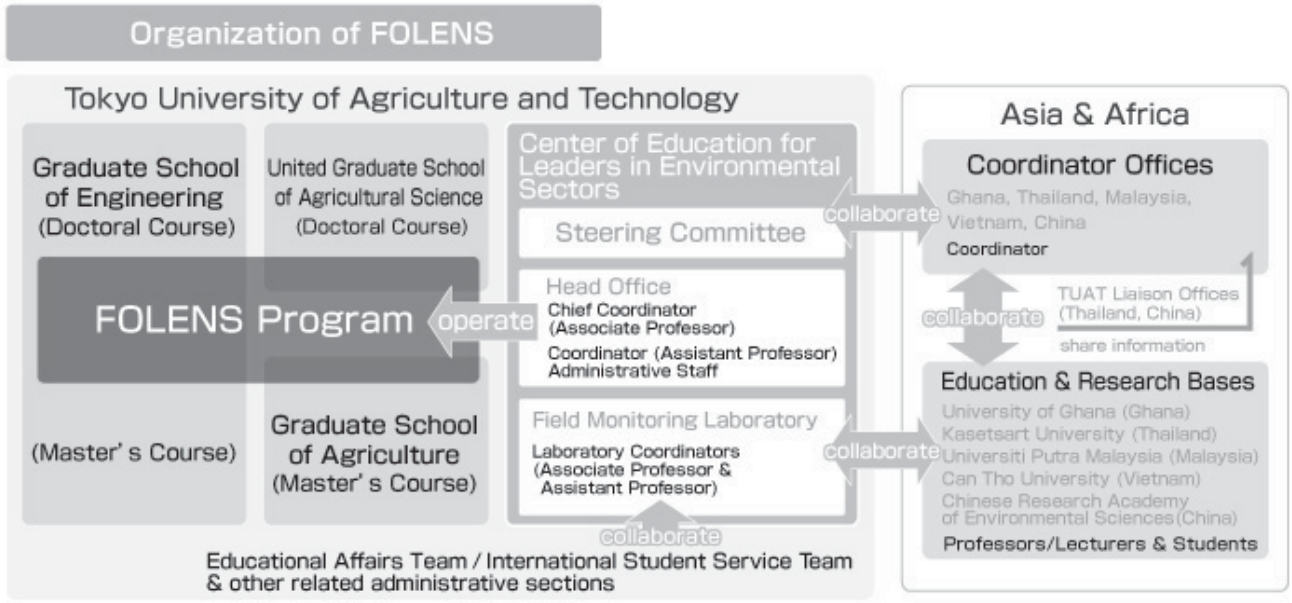
3

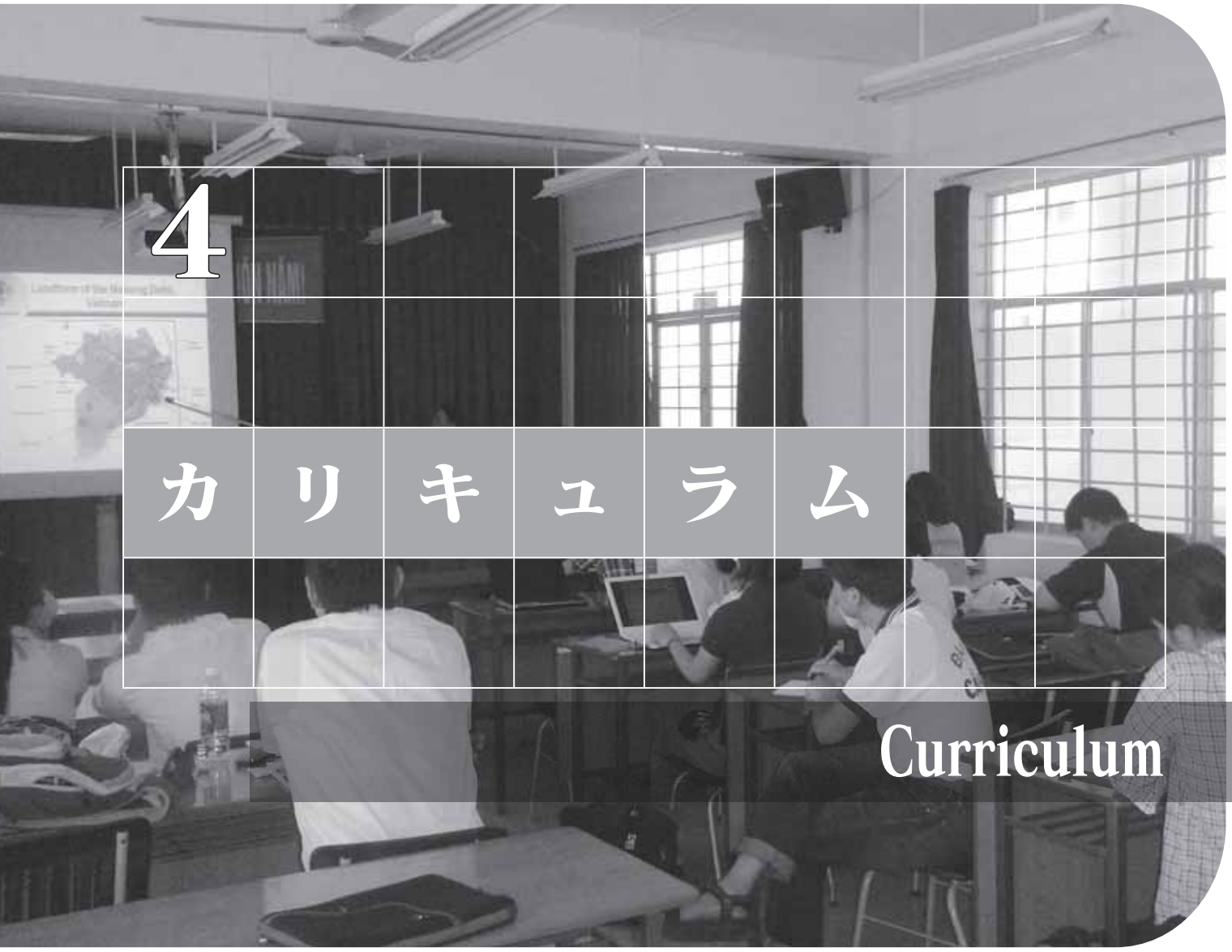
実　施　体　制

Organization

3. 実施体制 / Organization







4

カリキュラム

Curriculum

4. カリキュラム / Curriculum

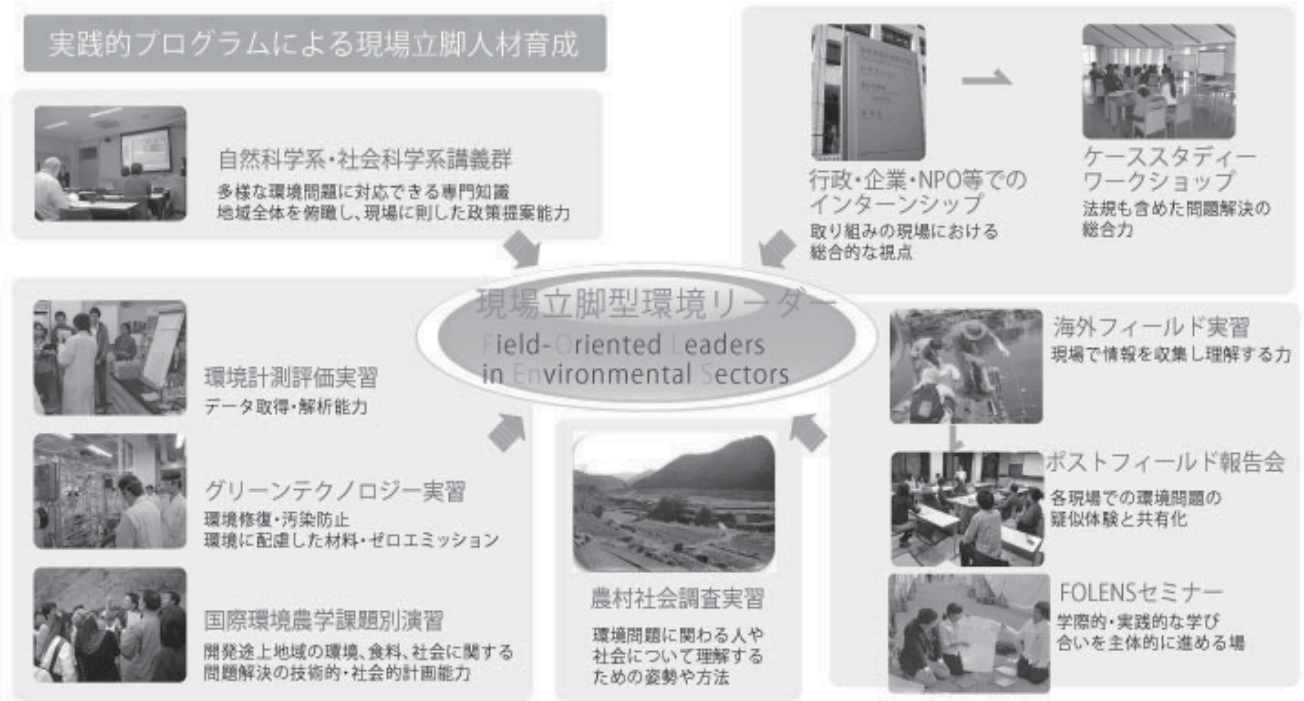
FOLENS が設置する**「アジア・アフリカ現場立脚型環境リーダー育成プログラム（FOLENS プログラム）」**では、講義と実習を組み合わせた体系的なカリキュラムにより、アジア・アフリカ地域の環境問題の把握と解決に貢献できるリーダー人材を育成します。 学生は、それぞれの本専攻に属しながら、本プログラムが定める講義・実習を追加補完的に履修します。プログラムは全て英語で実施します。日本人学生とアジア・アフリカ地域の留学生が、ともに学びあいながら、現場センスと国際的な視野を養います。

FOLENSプログラムには２つのコースがあります。

(1)**本コース・・・**本プログラムが定める**講義６単位**、及び**実習２単位**を、**既存専攻等での学位取得までに期間内に**履修します。

(2)**短期コース・・・**本プログラムが定める**講義４単位**、及び**国内実習１単位**を履修します。

（※本コースとの違いは、履修期間が短い点と、海外フィールド実習及びインターンシップが提供されない点です。）



The FOLENS program offers a postgraduate curriculum specially designed to develop leaders able to identify and solve environmental problems in Asia and Africa. It consists of practical training through field study and/or internships as well as lectures on environment-related natural and social science issues.

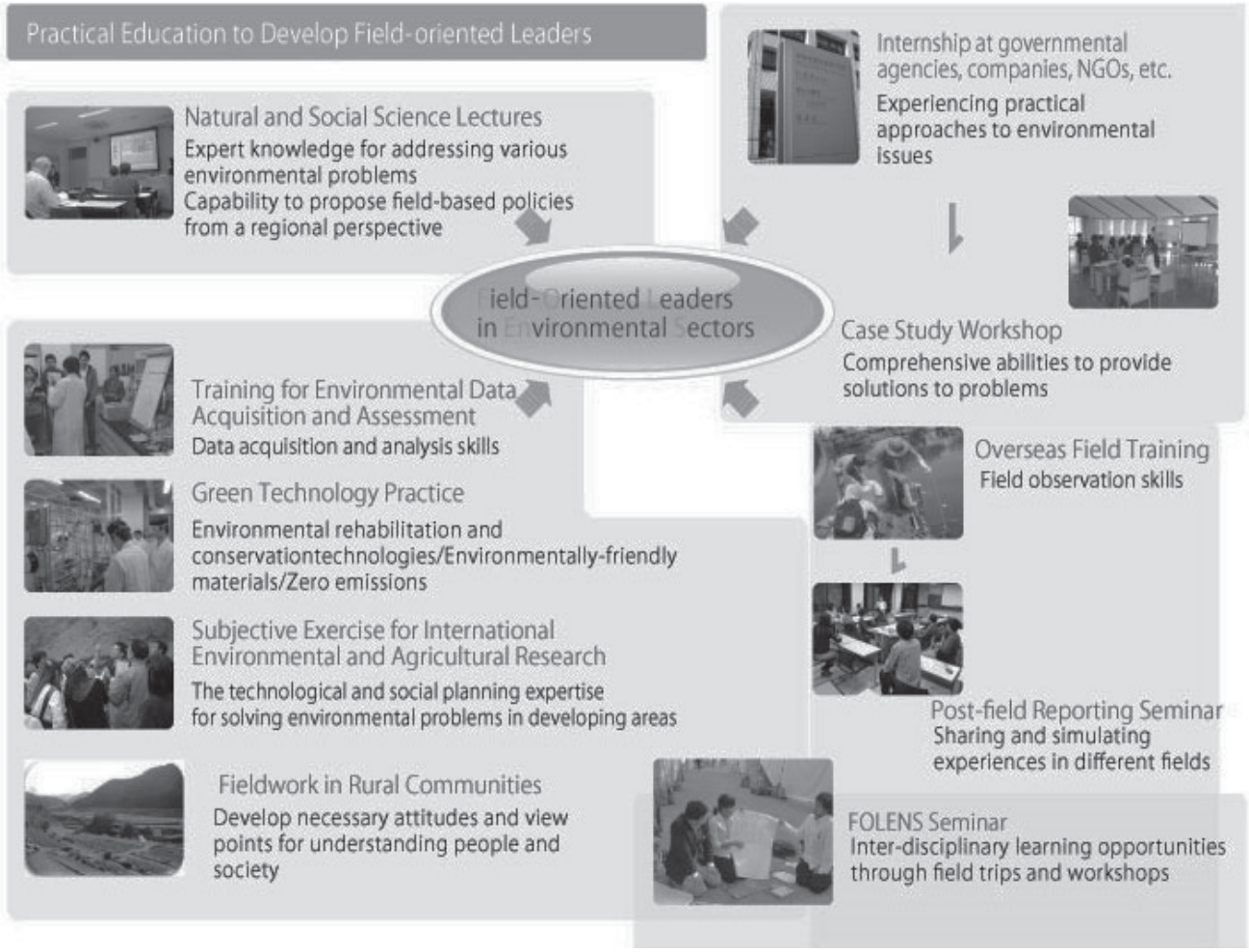
FOLENS students are required to complete lectures and practical training within the FOLENS curriculum while pursuing their degree. Some of the subjects/credits for the FOLENS program and a degree course may overlap.

All of the FOLENS classes are conducted in English. Students from Japan and abroad, particularly Asia and Africa, form an active learning community to nurture field-oriented mind and skills and to share international perspectives with each other.

FOLENS program offers two courses.

(1)**Regular Course**・・・Students enrolled in the Regular Course are required to complete at least **6 credits of lectures** and **2 credits of practical training** under the FOLENS curriculum within the period of their degree course.

(2)**Short Course**・・・Students enrolled in the Program are required to complete at least **4 credits of lectures** and **1 credit of practical training** under the FOLENS curriculum.



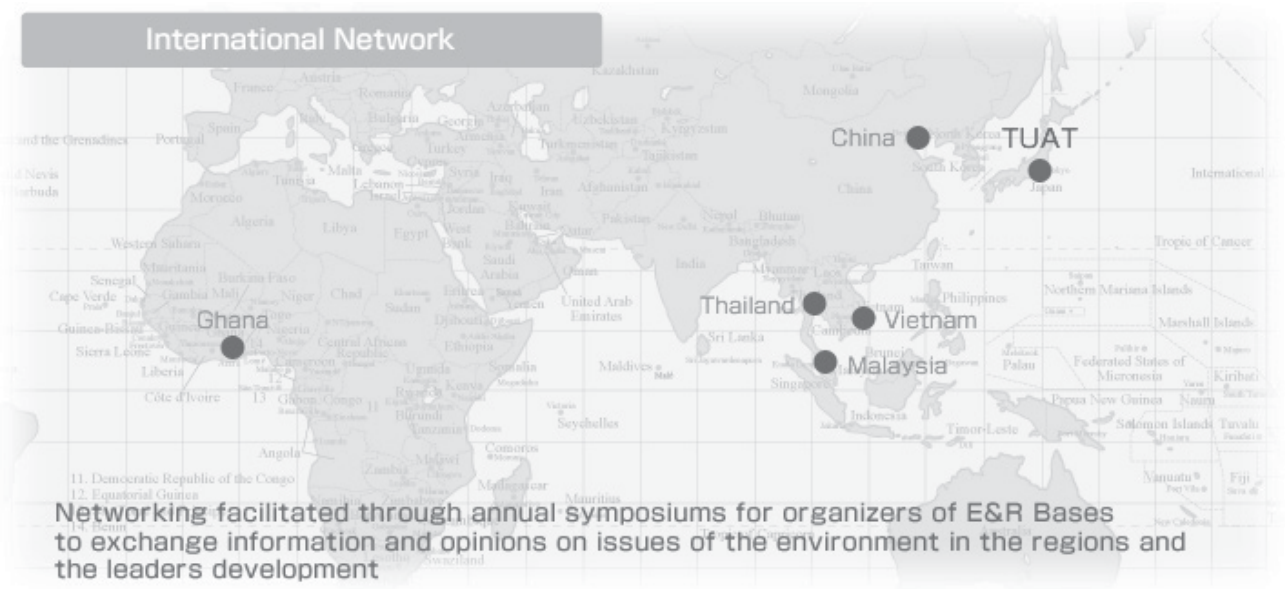
5 海外拠点ネットワーク

International Network

5. 海外拠点ネットワーク / International Network

FOLENS では、E&R Base として協力関係を結んだ４大学・１機関において、周辺環境に関する定点観測、留学生の発掘や留学生へのサポートなど当該国における広範なアウトリーチ業務、及び E&R Bases 運営管理への支援を行ってきました。

The FOLENS program has had its Education and Research Bases (E&R Bases) in Malaysia, Thailand, Vietnam, and Ghana, and China. The E&R Bases have been operated with collaboration by partner universities. Their two main functions have been to assist the implementation of Overseas Field Training and Internship and to conduct routine environmental monitoring for the accumulation of field-based information.



マレイシア・マレイシアプトラ大学/ Malaysia: University Putra Malaysia (UPM)

マレイシア・プトラ大学（University Putra Malaysia；UPM）は 1971 年にマレイシア農業大学として設立され、現在ではマレイシアの名門大学の一つとなっています。その環境科学部の一部、Center of Excellence in Environmental Forensics（環境法学センター）内に FOLENS の E&R Base は設置されました。センター長の Mohamad Zakaria Pauzi 准教授らの協力の下、現地観測が行われています。

Site theme: 熱帯域環境 (とくに汚染問題)のダイナミクス

UPM was established in 1971 as University Pertanian Malaysia (meaning Malaysia Agricultural University) and is now known to be one of the distinguished universities in the country. The FOLENS E&R Base in Malaysia has been set up in its Faculty of Environmental Studies. Assoc. Prof. Mohamad Zakaria Pauzi, Coordinator of Center of Excellence for Environmental Forensics, leads the collaboration as a main organizer with assistance by Dr. Ahmad Zaharin Aris.

Site theme: Environmental (particularly, pollution) dynamics in the tropics

タイ・カセサート大学/ Thailand: Kasetsart University (KU)

カセサート大学は、1943 年にタイで最初の農科大学として創立され、現在ではタイで最も権威のある大学の一つとなっています。その農学部内に FOLENS の E&R Base は設置されました。副学長の Samakkee Boonyawat 博士、農学部の Poonmipope Kasemsap 博士と Tiwa Pakoktom 博士らの協力の下、現地観測が行われています。

Site Theme: 熱帯地域の土地利用と環境問題

KU was founded in 1943 as part of the evolution of agricultural education in Thailand. It is now one of the best multi-disciplinary universities in the country with the vision to become “the world’s leading research university in agriculture, food, technology and innovation”. The International Studies Center hosts the FOLENS E&R Base. Director of the Center, Assoc. Prof. Poonpipope Kasemsap acts as the main organizer with support by Vice President for Research of KU, Assoc. Prof. Samakkee Boonyawat. Dr. Tiwa Pakoktom and Dr. Piyapong Tongdeenok also contribute to the E&R Base activities.

Site Theme: Land-use and environment in the tropics

ベトナム・カントー大学/ Vietnam: Can Tho University (CTU)

カントー大学はメコンデルタ地区の中心的な大学で、ベトナムの最先端の農業研究所を有しています。その環境学部内に FOLENS の E&R Base は設置されました。Nguyen Huu Chiem 副学部長らの協力の下、現地観測が行われています。

Site theme: メコンデルタの環境

Founded in 1966, CTU is the premier university in the Mekong Delta, the largest agricultural production area in Vietnam. Its main missions are training, conducting scientific research, and transferring technology to serve the regional and national socio-economic development. The E&R Base is set up in the College of the Environment and Natural Resources and the main organizer is Assoc. Prof. Le Viet Dung, Vice Rector for International Relations. Cooperating faculty includes Dr. Nguyen Van Be, Dr. Nguyen Hieu Trung, Dr. Nguyen Huu Chiem, Dr. Nguyen Van Cong, Dr. Nguyen Dinh Giang Nam, and Ms. Huynh Vuong Thu Minh.

Site theme: Environment of the Mekong Delta

ガーナ・ガーナ大学/ Ghana: University of Ghana (UG)

ガーナ大学は 1948 年に University College of the Gold Coast として設立され、ガーナ独立後の 1961 年にガーナ大学として発足しました。ガーナ国内の公立大学では最も古い歴史と最大の規模を誇っています。その農学部穀物科学科内に FOLENS の E&R Base は設置されました。John Ofosu-Anim 博士らの協力の下、現地において観測などを行っています。

Site theme: 土壌と水質の保全

UG was established in 1948 as the University College of the Gold Coast, and following the nation’s independence, it was constituted as the University of Ghana in 1961. It is known as one of the most prestigious universities in Africa. The FOLENS E&R Base in Ghana is hosted by the School of Agriculture, College of Agriculture and Consumer Sciences. Assoc. Prof. John Ofosu-Anim, Vice-Dean of the School, manages the Base as the main organizer, with assistance by Dr. Edward Benjamin Sabi.

Site theme: Soil and water conservation

中国・中国環境科学研究院/ China: Chinese Research Academy of Environmental Sciences (CRAES)

中国環境科学研究院は 1978 年に設立された、中国の環境問題研究の中核を担う国立の研究教育機関です。
FOLENS の E&R Base は、その中の土壌汚染対策室に設置されました。李発生室長らの協力のもと、土壌汚染対策のスキームの制度設計から土壌中の汚染物質の挙動まで、幅広く共同研究を行っています。

Site theme: Institutional design for soil contamination schemes Behavior of contaminants in the soil and groundwater
土壌・地下水における汚染物質の動態解析ならびに土壌汚染対策のための制度設計

CRAES was established in 1978 as a national non-profit research institute for environmental protection. In the environmental field, it plays a central role for education and research in China. The department of soil pollution control hosts the FOLENS E&R Base. Deputy General Manager Li Fasheng leads the collaborative investigation as a main organaizer.

Site theme: Institutional design for soil contamination schemes Behavior of contaminants in the soil and groundwater



6

活動報告

Activity Report



6-1. FOLENSにおける講義の概要 / Outline of lectures at the FOLENS

アジア・アフリカ地域には、水質汚濁、大気汚染、森林破壊、土壌劣化、生態系錯乱など、さまざまな環境問題が存在します。FOLENSプログラムでは、こうしたさまざまな問題を理解し対処するための自然科学系講義と、環境問題の社会経済的側面を分析し実効性の高い環境政策の提言につなげるための社会科学系講義が合わせて提供されています。

自然科学系講義群では、農学と工学、双方の視点から、統合的に学ぶことをめざしています。これらは、環境問題を科学的に理解し、環境を持続的に保全する知識と技術を学ぶ「環境科学系」講義、劣化した環境の修復や劣化防止、産業による環境負荷の低減に関する技術や制度を学ぶ「グリーンテクノロジー系」講義に分けられます。

社会科学系講義群では、アジア・アフリカの環境問題の現状と背景、それに対する国際協力の歴史と課題などを理解し、現地の状況に則した実効性の高い対策や政策を提言し実現するための「持続可能な社会と環境系」講義を行います。

自然科学系講義群で学ぶ実態評価や対策構築のための基礎的知識と、社会科学系の講義で学ぶ国際協力や地域の歴史背景などに関する視野、これら双方の視点や手法をFOLENSの講義で学ぶことができます。両者を合わせて身につけることは、現場の状況を的確に理解し、それにもとづく効果的な環境政策を提言・実施できる環境リーダーと求められています。

続いて、FOLENSカリキュラムでの講義一覧、その中で特色のある講義を担当していただいた先生に、その概要とご担当いただいての感想をお寄せいただいた文章を掲載します。

Asia and Africa are facing a myriad of environmental problems, such as water contamination, air pollution, deforestation, soil degradation, and ecosystem disturbance. The FOLENS program offers a series of lectures in different disciplines of the natural science, which will help students understand and respond to the said problems, and social science, which will equip students for analyzing the socioeconomic aspects of environmental problems and proposing effective environmental policies.

The Natural Science Lectures aim to train students comprehensively in both agricultural and engineering domains. These lectures are categorized into two types. Lectures in the environmental sciences category focus on the knowledge and skills needed for scientifically understanding environmental issues and managing the environment in a sustainable manner. Lectures in the green technologies category address the systems and technologies to be used for the restoration of degraded environments, prevention of environmental degradation, and promotion of environmentally friendly industries.

Social Science Lectures offer lectures on sustainable society and environment. This series of sessions aims to

provide a basis for formulating locally appropriate and effective measures and policies by shedding light on the status and background of environmental problems in Asia and Africa as well as the history and challenges of international cooperation in relation to such problems.

The FOLENS program offers opportunities for students to learn basic knowledge required for understanding local situations and developing effective countermeasures (Natural Science Lectures), international cooperation and local history and background (Social Science Lectures), as well as both of these perspectives and methods. Our students will obtain a broad perspective as well as skill sets required for leaders capable of appropriately understanding actual situations and designing effective environmental policies.

The following are the curriculum list of FOLENS, essays written by some faculty members who taught unique lectures as part of the FOLENS curriculum, summarizing their lectures and the experiences.

（尾崎宏和／Hirokazu Ozaki）

FOLENS 講義一覧/ Lectures in FOLENS

Sustainable Society & the Environment 持続可能な社会と環境			
アジア・アフリカの環境問題の現状と背景、それに対する国際協力の歴史と課題を理解し、現地の状況に則した対策や政策を提言し実現する力を育む **Understanding background and current status of environmental issues in Asia and Africa, the history and challenges of international cooperation. Cultivate abilities to propose policies a**		アジア・アフリカ環境問題特論（国際環境農学特論Ⅱ）* Environment and Sustainable Society in Asia and Africa (Advanced Lecture on International Environmental and Agricultural Science II)*	2
		国際開発協力論 International Development and Cooperation	
		地域開発政策学 Rural Development Policy	
		環境農業協力論 International Cooperation on Sustainable Agriculture	
		環境産業ビジネス論 Business Creation and Management for Environmental	
		プレゼンテーション演習 Presentation Skill Training	
		共生教育論 Symbiotic Education	
Environmental Sciences 環境科学			
環境問題を科学的に理解し、環境を持続的に保全する知識と技術を学ぶ **Learn the knowledge and skills to understand environmental issues scientifically to preserve the sustainable environment**	**Water Environment 水環境系**	水環境評価学 Aquatic Environmental Assessment	4
		水利環境保全学 Environmental Water Use & Conservation	
		熱帯水域汚染化学（環境化学特別講義） Pollution Chemistry in Tropical Marine Environment	
		地球環境論 Global Environment	
	Soil Environment 土壌環境系	地圏環境科学（環境化学特別講義Ⅰ）* Geosphere Environmental Science	
		生物資源循環利用学 Utilization of Sustainable Biological Resources	
		土壌環境保全学特論 Advanced Soil and Water Conservation	
		環境修復保全学 Environmental Rehabilitation and Conservation	
	Atmosphere and Forest Environment 大気・森林環境系	微気象観測特論（環境生物学特別講義Ⅱ）* Micoro Climate Monitoring	
		地域環境計画学 Regional Environmental Conservation Planning	
	Bio-Environment 環境生物系	地域持続生物生産技術学 Regional Sustainable Bio-Production Science	
		生態系生態学 Ecosystem Ecology	
		生態系管理学（環境生物学特別講義Ⅲ）* Ecosystem Management	
	Information system 情報系	生態情報学特論 Advanced Ecological Informatics	
		精密農業保全（農業環境工学特別講義Ⅰ）* Precision Agro-conservation	
		地球大気化学：その科学と哲学 Global Atmospheric Chemistry: Its Science and	
	Special Lecture 特別講義	プレゼンテーション演習 Presentation Skill Training (International Research	
		環境科学特別講義 Special Lecture on Environmental Sciences	
Green Technologies グリーンテクノロジー			
劣化した環境の修復や劣化防止手法、産業による環境負荷の低減に関する技術や制度を学ぶ **Lear the remediation and precvention technique from degraded environment, systems and technologies to reduce the environmental impact of industry**		触媒・微粒子工学（化学エネルギー工学特論Ⅱ）* Catalytic and Fine Particle Processing Engineering (Advanced Chemical Energy Engineering Ⅱ)*	
		水／排水処理工学（環境化学工学特論Ⅱ）* Water/Wastewater Engineering（Advanced Chemical Environmental Engineering Ⅱ）*	
		グリーンテクノロジー特論（物質生物計測講座特別講義Ⅲ）* Advanced Green Technology (Special Lecture on Analysis Science Ⅲ)*	
		技術英語表現法（システム化学工学講座特別講義Ⅳ）* Technical English (Advanced Systems Chemical Engineering IV)*	
		プレゼンテーション演習 Presentation Skill Training	
		グリーンテクノロジー特別講義 Special Lecture on Green Technologies	

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担当科目（開講専攻）： 共生教育論（共生持続社会学専攻）

降旗信一（農学府）

講義または実習の内容：

この授業の第一の到達目標は、「持続可能な社会のための教育」について、基礎的な理解をすること、また第二の到達目標は、「持続可能な社会のための教育的実践」について、その可能性と今日的な課題を提示できるようになることとした。これらのことについて受講者は「持続可能な社会のための教育」の理論と実践の現状を社会科学的に認識し、その課題と取組のあり方とを自分の言葉で説得力をもって語ることができることを到達目標とした。第 1 回のオリエンテーションに続き、第 2 回～第 4 回授業では「教育とは」「公教育と私教育」「日本国憲法 26 条」「公教育の歴史」「持続可能な発展のための教育（ESD）」といったキーワードから「教育」の意味の確認と共有を行った。第 5 回授業では、東日本大震災の被災地において環境教育の研究者たちがどのように行動したかを事例に、第 6 回授業では、北米の環境教育者たちが災害にどのように向き合ってきたかを事例にとりあげ、「持続可能な社会のための教育的実践」についての議論を行った。第 7 回授業では、国際自然保護連合（IUCN）の持続可能性教育のレポートをもとに「持続可能な社会のための教育」について議論を行った。第 8 回以降は６名の受講者がそれぞれ自分の修士課程における研究テーマについて報告を行い、その研究テーマから「持続可能な社会のための教育的実践」がどの様に展望できるかの議論を行った。

FOLENS プログラム科目として実施したことによる成果、課題、感想等：

この授業は、教員の着任後４年目に実施したものであり、授業としては３回目であった。過去二回と大きく変わったのは英語を標準使用言語としたこと、他専攻からの留学生が参加したことであった。英語を標準言語としたことは、当初はとまどいもあったものの、第８回以降の受講者の研究テーマの報告を英語で行ったことは、とりわけ MS 専攻においては英語の授業が少ないことなどからも、受講者にとっての貴重な経験であったと考えられる。また他専攻（ＭＩ専攻）からの留学生１名が参加したことは、専攻間の交流の面からも有意義であった。

課題としては、第７回目までの授業では教員からのレクチャーが中心であり、もっと受講者の主体的な授業参加の方法を考えるべきであった。また内容面でも学外での見学実習なども積極的に取り入れるべきであった。こうした点に留意し、国内学生とアジアからの留学生が日本の環境教育についての学びを共に深められるよう、次年度はさらに改善していきたい。

Subject (Department): Symbiotic Education (Department of Studies in Sustainable and Symbiotic Society)

Shinichi Furihata (Graduate School of Agriculture)

Lecture/Training Course Description:

The primary goal of this course was to provide students with basic knowledge of “education for a sustainable society.” The second goal was to present the possibilities and current issues in “educational practices for a sustainable society.” These goals were formulated for students to understand the theory and status of education for a sustainable

society according to the social scientific method. Subsequently, students could then describe the associated problems and the means to address them in a convincing manner and in their own words. Following the orientation on the first day, Lectures 2 to 4 were designed to ensure that both I, as instructor, and my students have a common understanding of the concept of education by reviewing key words, such as “what is education,” “public and private education,” “Article 26 of the Japanese Constitution,” “history of public education,” and “education for sustainable development.” We discussed the educational practices for a sustainable society using specific cases. For instance, in Lecture 5, we explored how environmental education researchers performed their work in the disaster-stricken areas after the Great East Japan Earthquake, and in Lecture 6, we focused on how North American environmental education researchers approached and dealt with disasters. In Lecture 7, we had a discussion on education for a sustainable society based on the sustainability education report published by the International Union for Conservation of Nature and Natural Resources. In Lecture 8 and later, six students presented their specific research topics, which they were pursuing in their respective master’s program. These presentations were followed by discussions on how the educational practices for a sustainable society can be viewed from the perspective of the research topics presented.

Outcomes, problems, and thoughts related to the course as a result of it being offered under the FOLENS program:

This academic year marks the third time for the course to be offered at the university, which coincides with my fourth year as instructor at the Faculty of Agriculture of The Graduate School of Agriculture. The most significant difference from the previous two times was the use of English as the standard language in this recently concluded course. Another difference was the accommodation of an international student from another field of study in the course. Although using English as the standard language was initially met with apprehension, its use is considered to have been a precious experience for the students, particularly during the presentation of their specific research topics in Lecture 8 and later, given that only a few MS courses are taught in English. In addition, participation by the international student from the Department of International Environmental and Agricultural Science also contributed to interdisciplinary communication in the course.

One of the issues that need to be improved is that the course was structured in such a way that classes up to Lecture 7 were primarily lectures based on a one-way communication method from the instructor to the students. More consideration should have been given on encouraging students to participate in the class proactively. In terms of the contents of the course, off-campus activities could have been incorporated, such as field trips and workshops. For the next academic year, keeping the above points in mind, I would like to improve the course further so as to help students from Japan and Asian countries enhance their learning on environmental education in Japan.

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担当科目（開講専攻）： 水・排水処理工学（応用化学専攻）
寺田昭彦（工学府）

講義または実習の内容：

水の世紀と言われる 21 世紀は、都市化が集中し 2050 年には世界人口の 7 割が都市に定住することが報告されている。地球上に存在する水のわずか 3%しかない淡水を人類は利用し、高度な社会環境を構築してきたが、これまで以上に都市部の排水を適切かつ安価に処理し、水環境に放流することの重要性が高まっている。このような現状を鑑みると、様々な技術・学問を融合した学際的アプローチによる排水処理の効率化が必要不可欠である。

本講義では、こういった背景を説明し、多様化する水・排水に関わる問題を抽出し、どのような技術を持って水・排水処理を進めていくか、について講義を進めてきた。各単位操作の原理を重点的に説明した。特に、処理性能が外部環境によって大きく変化する生物処理は、動力学的な説明に加え、簡単な数学モデルを構築してもらい、生物処理システムの性能をシミュレートさせた。学生にとって慣れない専門用語を理解し、モデル構築・シミュレーションするだけで大変な作業だったはずであるが、この試みに対する学生の評判は良く、座学の理解を深める意味で有意義な試みであったと考えている。

水・排水処理技術で適用される単位操作に話を戻すと、水・排水処理は一つの単位操作で完了するほど単純なものでなく、物理・化学・生物学的操作を集約したシステムを構築しなければいけない。厄介な点は、それぞれの単位操作でベストなものを揃えたところで総合的に優れたシステムを構築できるとは限らないことである。現場で求められている処理水の水質の放流基準、外部因子の考慮（例えば、現場の雨量）、求められるコスト、排水処理施設の周辺環境（例えば、居住地が近傍にある場合は悪臭などの追加対策の必要性）など、あらゆる因子を俯瞰して水・排水処理システムを構築しなければいけない。この重要性を講義してきたつもりである。つまり、100 の現場があれば、100 の異なる最適解があるはずで、学生には、各処理技術の基礎知識に加え、現場に立脚した総合的な評価ができる力やステークホルダーとの協議できる素養を身につけることの重要性も説明した。学生がこの点について理解を深めていただけたら幸いである。

また、FOLENS のコンセプトである現場立脚型リーダーを育てるために、東京都下水道局の協力を得て、北多摩一号水再生水再生センター（東京都府中市）の施設見学をさせて頂いた。センターの皆様にはこの場を借りて感謝申し上げたい。「排水の色」「汚泥の状態」「装置の音」「匂い」などを直接体験できたことは、講義で説明しきれない内容を補完すると同時に、排水処理施設をどのようにして設計・運転・管理しているか、学生が身を持って理解できる格好の機会であったと考えている。

課題点として、学生間同士でディスカッションする時間を設定できなかったことが挙げられる。留学生・日本人学生が自国の水環境問題に対する紹介や処理技術内容を理解し合うことための機会があって良かったと思う。この点を課題とし、今後も FOLENS の理念を継続させ、学生が能動的に技術を理解し、直接肌で触れ、各国の水環境問題を議論するといった、総合学習の場を提供していきたいと考えている。

Subject (Department): Water/Wastewater engineering (Department of applied chemistry)
Akihiko Terada (Graduate School of Engineering)

Lecture/Training Course Description:

Twenty first century is called the century of water. We are now in the era when urbanization is getting intensified. Reportedly, the trend will render 70% of world population inhabiting in urbanized areas in 2050. We have been using freshwater, accounting to only 3% of water in this planet, and developed sophisticated urban infrastructures. However,

considering such rapid urbanization, wastewater centralized from urban areas is required to be treated in an appropriate and cost-effective manner with more attention. Given the context, multidisciplinary approach towards improvement of wastewater treatment systems is highly desirable.

This course has aimed at explaining such background to focus on significance of water/wastewater treatment, extracting the relevant challenges and introducing technologies for removal of wastewater constituents and water reclamation. In this course, one of the central part, i.e. unit operation of a wastewater treatment technology, was explained. Especially, biological treatment is one of the most fragile process against external factors in a water/wastewater treatment system; hence, introduction of core parts of biological treatment −biokinetics and modeling − were intensively taught in my lecture. It was indeed big burden for students to get familiar with technical terms of the relevant topics in English, to develop a mechanistic model and simulate it to predict wastewater treatment performance. On the other hand, students found it interesting to understand knowledge on biological wastewater treatment via my lectures and computer exercise and highly evaluated the trial.

Getting back to the issue on a unit operation for water/wastewater treatment, it is not feasible to complete contaminant removal from water/wastewater in a single unit operation. Indeed, it is necessary to line up several unit operations based on physical, chemical and biological manners for water/wastewater removal. More importantly, individually assigning the best unit operations into a removal train may not necessarily be the best system for water/wastewater treatment. We need to incorporate multiple information, e.g. local legislation of treated water standard, external factors such as storm water, required cost, surrounding areas/circumstances of a water/wastewater treatment plant (WWTP), into the design. This point is essential for development of a WWTP, which is the main message I kept on conveying to students. This means that each case should have completely different optimal design and condition of a WWTP. That is why multidisciplinary approach, deeply rooted with the concept of FOLENS program, is genuinely important in terms of water/wastewater engineering. This includes not only technical knowledge on water/wastewater treatment technology but also holistic skills, for instance, to discuss the design of WWTPs with stakeholders (incl. local people). I would appreciate it if students could find this really important.

In addition to these trials in this course, we visited a water reclamation center (Kitatama-Ichigo, Fuchu, Tokyo) at the end of the whole schedule. I would like to acknowledge the staffs for their giving us the opportunities. Students were able to see colors of wastewaters and conditions of sludge, to hear sounds of apparatuses, and even to smell water and sludge. This opportunity allowed us to compensate missing parts of my lectures and to learn how a WWTP is designed, operated and maintained.

One challenge in future is to set up time when students can freely discuss legislation of discharged water standards in their own countries and a typical process train in a WWTP. Finally, I hope this course could continuously provide a place for integrated study where students learn technical issues of water/wastewater engineering, experience a real field, i.e. WWTP and discuss topics on water/wastewater. I believe the continuity of not only mine but also other courses inherits an essence of the FOLES program where we are able to educate students to become field-oriented leaders in Asia and Africa.

6-2. 環境計測評価実習 / Training for Environmental Data Acquisition and Assessment

「環境計測評価実習」は、野外での試料採取・調査方法と、採取された試料の分析および得られたデータの解析手法などを扱います。具体的には、本学農場（FM 府中）にご協力いただき農場で土壌をサンプリングしその元素分析を行うこと、多摩川の河川調査で下水処理の影響を受ける都市河川の水質（イオン、抗生物質、大腸菌）を検討しながら、これら指標の環境科学的な意味と環境問題としての相互関連性、実験室での作業に関する基礎知識、データの扱い方と解析の仕方を学びます。

FOLENS では多様な分野の学生が参加しますので、専門性に関わらず共通すると思われる基本の再確認をひとつの柱としました。私自身の経験からも、基礎的事項であればあるほど、必ずしも理解が十分でない場合が多いためです。それぞれの分野との関係が予想外に認識され、視点を広げる機会にもなっています。自分の研究室では聞くに聞けない質問も、多専攻の学生で学ぶからこそ質問しやすいこともあったようです。また分析系でない学生には、検量線の作成やその適用範囲など分析化学に関する知識も浅いため、環境分析の基礎を着実に身に付け、応用的な部分にも触れることで発展へとつなげることを心がけています。

Training for Environmental Data Acquisition and Assessment deals with field sampling as well as survey and laboratory analysis methods for samples gathered from field surveys. Specifically, in collaboration with FM Fuchu (university farm), we collect soil samples at the farm for elementary analysis and then conduct surveys at Tama River to monitor the water quality (ions, antibiotics, and *E. coli*) of urban rivers affected by sewage treatment. Further, we aim to determine the significances of these indicators in environmental science and their interrelationships within the frameworks of environmental problems. This training provides basic knowledge on laboratory procedures as well as data handling and analysis.

FOLENS welcomes students from diverse academic backgrounds. Therefore, we have set, as a pillar of our Domestic Training, the relearning of basics believed to be common to all fields. This approach is attributed to the tendency of students to have limited understanding of basic matters, based from my experience. This training also serves as an opportunity for students to broaden their perspectives by pointing out unexpected interrelationships among different disciplines. Further, under the FOLENS program, students find it easier to ask questions that may be difficult to ask in their own laboratories because they learn with peers from many different disciplines. Meanwhile, as students with no analytical background may lack sufficient knowledge in analytical chemistry, such as the creation and application of calibration curves, we make sure that our students obtain a firm understanding of the basics of environmental analysis and their applications.

（尾崎宏和／Hirokazu Ozaki）

多摩川調査／Field survey in Tama River

大腸菌・大腸菌群カウント／Coliform and *E.coli* counting

多摩川調査／Field survey in Tama River

原子吸光計による元素分析／ Elemental analysis by atomic absorption spectrophotometer

6-3. グリーンテクノロジー実習/Green Technology Practice

グリーンテクノロジー国内実習は、2010 年度は、実用的なわが国の最新技術を学ぶという観点から、環境管理、安全管理、品質管理に焦点を当てました。具体的には、渋谷清掃工場、簡易測定手法、安全講習、環境管理手法としての環境レポートの理解、サンプリング及び分析における品質管理を実習テーマとしました。2011 年度は題材としてバイオ燃料を取り上げ、学生による各地の利用状況の調査と発表、廃油からのバイオディーゼル燃料製造実験、関東地域を対象としたバイオディーゼル燃料製造システムのコスト評価、および千葉県夷隅郡大多喜町でのバイオディーゼル燃料に関する取組みの見学を行いました。環境技術として多面性をもち、また製造システムとしても様々な特徴を有するバイオ燃料の一端を FOLENS 生たちも肌で感じてくれました。

2012 年度および 2013 年度は、アジアの廃棄物処理の現状紹介、処分場見学と実験により改善を考えるという 3 点に重点を置き行いました。最初 2 日間、日本とタイの廃棄物処理の現状を講義しました。次に埼玉県環境科学国際センターを訪れ、研究者とアジアの処分場に付いて議論し、その後埼玉県寄居ごみ最終処分場を見学し、浸出水と土壌（浸出水浄化用）をサンプリングしました。最後に 3 日間持ち帰った浸出水と土壌を用いて、浸出水水質分析を行い、次にサンプリングした土壌の透過反応性壁としての効果を評価するために浸出水中 TOC 除去テストを行い、 汚染されたアジアの処分場の一つの修復技術を学びました。
将来環境リーダーになるという自覚をもち、活発な質疑討論が本実習を通して、現場、教員及び学生間でされました。

The Green Technology Practice, which was part of the domestic training in 2010, focused on environmental management, safety management, and quality control from the perspective of learning the practical cutting-edge technologies in Japan. The specific activities of the training included visiting the Shibuya Waste Treatment Plant, learning the simplified measurement method, attending the lecture for safety measures, studying environmental reports as a measure of environmental management, and learning quality control for sampling and analysis.

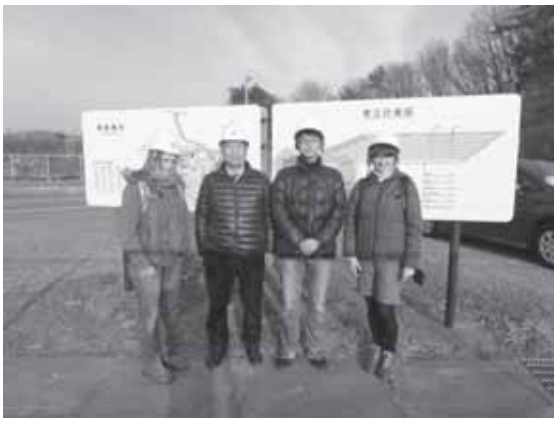
In 2011, the subject of the training was biofuel. The students conducted research and made presentations on the current status of biofuels in various places, as well as experiments on biodiesel fuel production from waste oil and the cost evaluation of the biodiesel fuel production systems in the Kanto region. They also visited Otaki-machi, Isumi-gun in Chiba Prefecture to observe their initiatives in producing and using biodiesel fuels. The FOLENS students understood some aspects of biofuel, which has multiple facets in terms of environmental technology, as well as various characteristics in terms of its production system.

In 2012 and 2013, the training placed an emphasis on three points:
1. An introduction to the current status of the waste management in Asia.
2. An observation trip to the landfill.
3. An investigation on the improvement of landfill through experiments.

For the first two days of the training, the students attended lectures on the current status of waste management in Japan and Thailand. The group then visited the Center for Environmental Science in Saitama and discussed landfill in Asia with the researchers. Subsequently, they visited the Yorii Waste Final landfill in Saitama Prefecture and took samples of the leachate and the soil, which is used to purify the leachate. Finally, for the last three days, the water quality of the leachate was analyzed using samples taken and a test was conducted for the TOC removal in the leachate to evaluate the soil for the Permeable Reactive Barrier, and the students had the opportunity to learn one of the remediation technologies for the polluted landfill in Asia.

With the objective of becoming leaders in the environmental sector in the future, various questions were raised and active discussions were led throughout the training among the people from the observation sites, the faculty members and the students.

（米田健一／ Kenichi YONEDA）



埼玉県寄居最終処分場/The Yorii Final Landfill in Saitama Prefecture

土壌による浸出水浄化試験/Soil evaluation test for the pollutant removal in the leachate

埼玉県寄居最終処分場/The Yorii Final Landfill in Saitama Prefecture

浸出水の水質分析/Analyzing the water quality of the leachate

6-4. 農村社会調査実習 Fieldwork in Rural Communities

「農村社会調査実習」は、環境問題を理解し対策に取り組む上で欠かせない「社会と人」の理解に焦点を当てる国内実習科目として、2012 年度より開講されました。「社会と人」を理解するプロセスは、他の FOLENS 国内実習科目で行うような、土や水等を採取して計測したり、技術的な実験を行ったりする過程とはだいぶ異なります。本実習では、たった数日の実習期間中に、ある現場の「社会と人」を理解できると考えるのはそもそもおこがましいという認識から、それよりも、実習を通じて学生らが訪問先の人々や社会から学びながら、人や社会を理解することの難しさと重要性を体感し、必要な姿勢や視点を身につけることこそが目指すべき到達点であろうと考え実施してきました。

初回の 2012 年度は熊本県水俣市、2013 年度は福島県二本松市東和地区を訪問させていただきました。各回の様子を下記に報告しますが、学生レポートを含むより詳細な報告を別途まとめており、下記よりダウンロードすることが可能です。

2012 年度報告書：http://www.tuat.ac.jp/~folens/report/report24.html
2013 年度報告書：http://www.tuat.ac.jp/~folens/report/

'Fieldwork in Rural Communities' was created in 2012 as one of the domestic practical training courses of FOLENS, with a special focus on "people and society." The process to understand people and society is largely different from the process used to sample and measure soil or water, or to experiment with certain engineering technologies as conducted in other FOLENS training courses. As we recognize that it is impossible and even presumptuous for us to attempt to "understand people and society" in a certain field on a three-day training, our goal is for students to "learn from" people and society in the field, experience the difficulties and the importance of understanding people and society, and acquire the appropriate attitudes and viewpoints necessary to understand them.

In 2012, we visited Minamata in Kumamoto Prefecture; in 2013, we visited Towa District, Nihonmatsu City in Fukushima Prefecture. The following is a brief report of our fieldwork training at these sites. More detailed reports including those by students can be downloaded from the following links.

Report – Fieldwork in Minamata 2012: https://www.tuat.ac.jp/~folens/report/report24_e.html
Report – Fieldwork in Towa 2013: http://www.tuat.ac.jp/~folens/report/

2012 年度—農村社会調査実習 in 水俣 2012 - Fieldwork in Minamata

初年度の実習地として、水俣を訪問させていただきました。水俣は、日本が経験した最も深刻な公害問題の地として、またその経験にもとづく様々な取組から現在は先進的な環境都市として知られます。将来、アジア・アフリカ地域の環境リーダーとして活躍することを目指す本プログラムの学生にとって、水俣の社会や人々のこうした経験から学ぶことは、大きな意味を持ちます。さらに、水俣には「地元学」という、地域と人を地元の人々自らがとらえ活かすための注目すべき実践があり、これは厳しい水俣病問題からの立ち直りにつながる取組でもあります。本実習では、水俣の社会と人々の経験に学びながら、「地元学」のプロセ

スを（ほんの一部ですが）体験し、人や社会を理解するための姿勢や視点を身につけるという重層的な学習をできるだけ実現しようと、2 回の事前学習に続く 3 日間の訪問期間中、水俣の多くの方々にお世話になりながら、密度の濃い実習を行いました。特に、水俣地元学の提唱者でおられる吉本哲郎氏には重厚なお話と温かくも厳しいご指導をいただき、全体コーディネートをお引き受けいただいたグリーンスポーツみなまたの小里アリサ氏には大変きめ細かい調整とアドバイスをいただきました。ほかにも、様々な方々に貴重なご経験に基づくお話をお伺いしました。

For our first year, we visited Minamata in Kumamoto Prefecture. It is known as a place that has experienced one of the most severe pollution-related health problems in Japan but has also become one of the most advanced sustainable cities in Japan because of its experience with pollution.

For our students, who aim to become future environmental leaders in various communities around the world, it is enormously beneficial to learn from the experience of the people and society in Minamata. Moreover, people in Minamata have "*Jimotogaku*," a form of community participatory study, that they have developed as a process to regain their prides and reconcile conflicts within their community.

Thus, this training for our students had multi-layered goals – to learn from Minamata's history, to experience "*Jimotogaku"* (though only in a small way), and to acquire the appropriate attitudes and viewpoints for understanding people and society. This intense course could only be realized thanks to Ms. Arisa Ori, who coordinated the overall structure of the fieldwork; Mr. Tetsuro Yoshimoto, who taught us the essence of "*Jimotogaku"* with his both austerity and humor; and many others in Minamata.

■事前講義 Introduction to Fieldwork in Minamata

日時：2012 年 7 月 3 日（火）16:30-18:00（5 限）
場所：東京農工大学府中キャンパス　本館 22－A
内容：
水俣実習の背景に関する講義・ビデオ上映
- 水俣病～歴史と背景
- なぜ？なに？水俣地元学

学生発表のグループ決定

Date: 3 July
Time: 16:30-18:00 (5th Period)
Place: Room 22-A, Main Building (Honkan 22-A), Fuchu Campus
Contents:
Lecture/video on background of Minamata Fieldwork
- Minamata Disease – History and background
- Minamata Jimotogaku or participatory community study - why and what?

Division of students into groups for presentation on 18 July

■学生発表 Students Presentation

日時：2012 年 7 月 18 日（水）13:00-14:30（3 限）

場所：東京農工大学府中キャンパス　2 号館 N103

内容：

学生による発表～アジア・アフリカ地域の公害と人々や社会に対するその影響

- 中国・内モンゴル
- タイ
- アフガニスタン
- ウズベキスタン
- モザンビーク

水俣実習の概要

Date: 18 July

Time: 13:00-14:30 (3rd Period)

Place: N103 (Multi-purpose Lecture Room), Building 2, Fuchu Campus

Contents:

Presentation by students

- Pollution and its impacts to people and society in Asia and Africa

Information on the Minamata field work

■水俣実習 Fieldwork in Minamata

日時：2012 年 7 月 24 日（火）～26 日（木）

協力：水俣市・水俣市立水俣病資料館

内容：

1 日目～水俣病について学ぶ・資料館

2 日目～地元学研修・吉本哲郎氏による指導

3 日目～地元学研修ふりかえり

現在の水俣を学ぶ・JNC 訪問

Date: 24-26 July

Contents:

Day 1: Learning about Minamata Disease—visit to museums and local communities

Day 2: Training for participatory community study— “Jimoto-gaku” – by Mr. Tesuro Yshimoto

Day 3: Reflection on the participatory community study training/ Learning about present Minamata — Visit to Chisso/JNC

水俣実習スケジュール詳細 （時間はおおよそ)Minamata Fieldwork: Schedule

7月24日(火) July 24 (Tuesday)

時間 Time	活動 Activity	講師 Lecturer
10:00	熊本空港より水俣へ移動（バス） 水俣研修オリエンテーション・地元学講話 Meet at Kumamoto Airport Move to Minamata by Bus Lecture on Participatory Community Study (Jimotogaku) by Mr. Yoshimoto	吉本哲郎氏（地元学ネットワーク主宰） Mr. Tetsuro Yoshimoto (President, *Jimotogaku* Network)
11:30	水俣着／昼食（たけんこ） Arrive in Minamata Meet Ms. Ori, Coordinator Lunch	
12:20	少林寺道場に荷物搬入 Carry the bags to Shorinji Dojo (Fieldwork Base and Accommodation)	
12:30	市立水俣病資料館見学 Minamata Disease Municipal Museum	小里アリサ氏（水俣自然学校） Ms. Arisa Ori (Minamata Nature School)
13:30	水俣湾埋立地親水護岸見学 Minamata Bay Water Amenity Seawall	小里アリサ氏 Ms. Arisa Ori
14:00	親水護岸出発 Depart Water Amenity Seawall	
14:15	水俣病センター相思社着 水俣病事件の概要と市民の取り組み Soshisha, The Supporting Center for Minamata Disease/ Overview of Minamata Disease Incidents and Citizens' Actions	遠藤邦夫氏（水俣病センター相思社） Mr. Kunio Endo (Soshisha- the Supporting Center for Minamata Disease)
16:15	相思社出発 Depart Shoshisha	
16:30	茂道着・杉本雄さんのお話 Arrive in Modo District/ Story by a Minamata Disease victim	杉本雄氏（杉本水産・水俣病資料館語り部） Mr. Takeshi Sugimoto (Fisherman/Witness for Minamata Disease Municipal Museum)
18:30	茂道出発　Depart Modo District	

18:50	少林寺道場着　Arrive in Shorinji Dojo Information: Accommodation Prepare Dinner	
19:30	夕食　Dinner	
20:00	水俣の印象のまとめ・翌日のスケジュール説明・班編成・地元学講話 Reflection of the Day – Impressions of Minamata Information: Schedule of Day2 (Jimotogaku Talk)	吉本哲郎氏 Mr. Tetsuro Yoshimoto
22:00	入浴・就寝　Shower/ Sleep	

7月25日（水） July 25 (Wednesday)

時間 Time	活動 Activity	講師 Lecturer
7:00	起床・朝食・そうじGet up/ Breakfast/ Clean the room	
8:30	地元学の進め方説明 ・あるもの探しについて：何を調べ、どのように行なうのか確認 ・地元の方、リーダー紹介 地元学リーダー： 天野浩氏（天の製茶園・水俣市環境マイスター） 井上克彦氏（竹細工職人・水俣市環境マイスター） 遠藤邦夫氏・満島朋子氏・木下氏（水俣病センター相思社） 竹下昭博氏（水俣市立水俣病資料館） 池﨑翔子氏（水俣市役所） 福井隆氏（農工大客員教授） Lecture - Explanation of the process of *Jimotogaku* (Participatory Community Study) – Arumono Sagashi (Looking for Things that a Community Has) - Introduction of Local People and Study Leaders *Jimotogaku* Leaders: · Mr. Hiroshi Amano (Organic tea producer/ *Minamata City environmental meister*) · Mr. Katsuhiko Inoue (Bamboo craftsman/ *Minamata City environmental meister*) · Mr. Kunio Endo, Ms. Tomoko Mitsushima, and Mr. Kinoshita (Soshisha – the Supporting Center for Minamata Disease)	吉本哲郎氏 小里アリサ氏 Mr. Tetsuro Yoshimoto Ms. Arisa Ori

	· Mr. Akihiro Takeshita (Minamata Disease Municipal Museum) · Ms. Shoko Ikezaki (Minamata Municipal Government) Mr. Takashi Fukui (TUAT visiting professor)	
9:00	班ごとに分かれて明神に住む人たちの聞き取り 吉永理巳子氏・大矢ミツコ氏・嶋田とし子氏 前田和昭氏 Group Work – Interview to local people Local Residents: Ms. Rimiko Yoshinaga Ms. Mitsuko Ooya	
12:00	昼食 Lunch	
13:00	絵地図づくり・こうなったらいいなの提案 Make a Map – Propose Ideas	吉本哲郎氏・リーダー Mr. Yoshimoto/ Local leaders
18:00	絵地図発表 留学生の母国の公害問題の発表 Map Presentation	吉本哲郎氏 地元の方々 Mr. Yoshimoto /Local people
20:00	夕食（地元の方々と BBQ）・入浴 BBQ with Locals/ Shower	
22:00	就寝 Sleep	

7月26日（木） July 26 (Thursday)

時間 Time	活動 Activity	講師 Lecturer
7:00	起床・朝食 Get up/ Breakfast/ Clean the rooms	
8:30	振り返り～一日目と二日目で思ったこと、気づいたこと、驚いたこと。これからしたいこと、自分の地元や自国でどう活かすかなど Reflection Impressions/ realization of the Day1 & 2 – What I can do in my own local community based on this experience	吉本哲郎氏 小里アリサ氏 福井隆氏 Mr. Tetsuro Yoshimoto Ms. Arisa Ori Mr. Takashi Fukumoto
10:45	講評 Closing Remarks	吉本哲郎氏 Mr. Yoshimoto
11:00	道場片付け Clean up the rooms 市立水俣病資料館へ絵地図贈呈 Presentation of Maps to Minamata Disease Municipal Museum	小里アリサ氏 Ms. Arisa Ori
12:00	出発・昼食（たけんこ）	

	Departure Lunch/ Shopping	
13:30	JNC（前チッソ）株式会社　講義・見学 Visit JNC (Chisso)	
15:30	出発 Depart Minamata	









2013 年度—農村社会調査実習 in　福島・東和 2012 - Fieldwork in Towa, Fukushima

2013 年度は、福島県二本松市東和地区を訪問しました。ここは、2011 年の福島原発事故により放射能汚染の被害を受けながらも、それまでの住民が主体となった地域づくりの経験をもとに、外部の研究者とも連携しながら、実態解明と課題解決へ向けて、着実に先駆的な取組を進める地域です。実習にあたっては、こうした取組の中核となってきた「ゆうきの里東和ふるさとづくり協議会」、特に専務理事・事務局長の武藤正敏さんに全体のコーディネート等、多大なご協力をいただきました。 事前学習として、本学教員らによる現地調査からみえてきた放射能汚染の状況・対策に関する実態や、経済的・社会的影響を含む原発事故がもたらした複雑な課題群、さらに東和地区の地理的環境、地域の特色について学び合い、実習当日を迎えました。

実習初日は、地元リーダーによる概要説明の後、４軒の農家民宿に分かれて現地の生活を垣間見させていただきながら、美味しい夕食を囲み、原発事故後の御苦労についてもお話を聞かせていただきました。二日目は、前年度の水俣実習で、吉本哲郎さんよりご指導いただいた「地元学」の「あるものさがし」をもとに、農家民宿の周囲を歩き回り（時に車に乗せていただき）ながら、地域に「あるもの」を確認し、出会った方々にお話を聞き、それらを記録し、絵地図ポスターにまとめました。作成したポスターと、それをもとにした学生からの「提案」は、多くの地元の方々に参加いただいた夜の交流会で発表し、温かいコメント、アドバイスをいただくことができました。三日目は、農作業のお手伝いの予定が、雨もあり、ほんの少しの作業とお茶の時間になってしまったグループも。お世話になった農家さんへの恩返し、にはなりませんでしたが、学生らにとっては、東和の方々の温かさと強さ、そして地域としてのつながりと行動力について、交流を通じて強く感じ、じっくりと考える機会となりました。

In 2013, we visited Towa District of Nihonmatsu City in Fukushima Prefecture. Towa is a rural community that has been developing through its organic farming and networking; however, it has faced a serious challenge since March 2011. The Fukushima Daiichi nuclear disaster that followed the Tohoku Great Earthquake discharged radioactive substances, contaminating the surrounding region, including Towa.

The people in Towa have been struggling to ascertain the actual situation from the radiation pollution and to find possible solutions to protect their agriculture and life. Because of its strong internal and external network capability, Towa has attracted a number of supporters, including the TUAT research project teams. The Committee for Organic Farming and Community Development in Towa (Yukinosato Towa Furusatozukuri Kyogikai) and its Executive Director, Mr. Masatoshi Muto, who have coordinated such networking, hosted our visit and provided great assistance. Throughout the three-day visit, with two preparatory study sessions, the students learned of the warmth and strength of the people of Towa and their ability to take initiative and action within their own community.

■事前講義 Introduction to Fieldwork in Towa (Nihonmatsu, Fukushima)

日時：2013 年 6 月 19 日 16：30－18：30

場所：府中キャンパス第一講義棟 21 号

内容：

- 本実習の概要（二ノ宮リムさち）
- 福島県二本松市東和地区と農工大の協働研究の背景とこれまでの成果～放射能汚染と農業への影（木村ベリングラート園子ドロテア）
- 福島原発事故に関わる課題とは何か・事前学習＆フィールドワークのグループ希望調査

Date: 19 June

Time: 16:30-18:30

Place: Room No. 21, Lecture Hall 1, Fuchu Campus

Contents:

16:30-16:40	Overview of this Course: Sachi Ninomiya-Lim
16:40-17:10	Background and Findings of TUAT Research Collaboration with Farmers in Towa – Radiation Pollution and Its Impact on Agriculture: Sonoko Dorothea Bellingrath-Kimura
17:10-17:40	Questions & Answers
17:40-18:20	Workshop – What are the Issues?
18:20-18:30	Grouping for Pre-Study and Fieldwork

■学生発表 Students Presentation

日時：2013 年 7 月 3 日 16:30-18:30

場所：府中キャンパス新二号館多目的室（N-103）

内容：

- グループ発表：福島原発事故の背景や課題
- フィールドワーク・あるものさがしとは（及川洋征）
- 東和の地理的環境と地域の特色（山田祐彰）

· 東和フィールドワークに関する概要（二ノ宮リムさち）

Date: 3 July

Time: 5th Period (16:30-18:30)

Place: N-103 (Multi-purpose Room), 2N Building, Fuchu Campus（Contents:

Contents:

16:30-17:50 Group Presentation on the Issues of Fukushima Nuclear Power Plant Accident (Presentation for 10 min & Q&A for 10 min x 4 groups)

17:50-18:05 Lecture: What is "Fieldwork"? (Oikawa)

18:05-18:20 Lecture: Geography and History of Towa (Yamada)

18:20-18:30 Information on the Towa Fieldwork on 13-15 July (Ninomiya-Lim)

■東和(福島県二本松市)実習 Fieldwork in Towa （Nihonmatsu, Fukushima）

日時：2013 年 7 月 13 日～15 日

内容：

1 日目～地元リーダーとの交流

2 日目～グループでのフィールドワーク（あるものさがし）

3 日目～発表会とふりかえり

Date: 13-15 July

Contents:

Day 1: Talk by Local Leaders

Day 2: Fieldwork in Groups

Day 3: Presentation and Reflection

東和実習スケジュール詳細 Towa Fieldwork: Schedule

7/13（土）July 13 (Saturday)

時間 Time	**活動 Activity**
7:00	Meet at the Main Gate of TUAT Fuchu Campus
7:20	Depart (Bus) Orientation/ Self-introduction/ Lecture…
13:00	Arrive in Towa Roadside Station, Nihonmatsu City, Fukushima Pref. (道の駅ふくしま東和) Lunch　昼食
14:00	全体オリエンテーション Orientation 14:00-14:10 実習の趣旨　Introduction 14:10-14:40 震災・原発事故と東和～放射能汚染・農業・地域振興（武藤正敏さん　ゆうきの里東和ふるさとづくり協議会　専務理事・事務局長）Talk by Mr. Masatoshi Muto, Executive Director, Committee for Organic Farming and Community Development in

	Towa: Organic Agriculture and Radiation Pollution after Tohoku Earthquake and Nuclear Disaster 14:40-15:10 若手リーダーの話 Talk by local young leaders 15:10-15:40 質疑応答・意見交換 Q&A/ Discussion
16:00	Go to Farmer's Guest House: work/ dinner/ sleep グループごとに農家民宿へ移動～作業手伝い・夕食・宿泊

7/14（日）July 14 (Sunday)

時間 Time	活動 Activity
8:30	Group Work - Participatory Community Study "Find What They Have (Arumono Sagashi)" - Walk around the community - Interview people/ Take photos/ Record what you find Farm Work グループごとに「あるものさがし」（農家民宿を中心に徒歩で地域の「あるもの」（資源）を探し記録） …メモ・筆記用具・カメラ・水筒・帽子・タオル …Digital camera, Notebook, Pens/pencils, Water bottle, Hat, Towel
12:30	Lunch 昼食・Shower シャワー
14:00	Meet at Towa Roadside Station / Group work: Make maps/ posters 道の駅ふくしま東和に集合～グループごとにマップ＆「提案」作成
18:00	Party with Locals at Towa Roadside Station 交流会（道の駅） Students' Presentation: - Fieldwork Maps/Posters - Life of rural communities in the international students' home countries 学生発表「あるものさがしマップ・ポスター＆『学生からの提案』」「留学生母国の農村のくらし」
20:30	Back to Farmer's Guest House: Sleep　解散～各農家民宿へ

7/15（月）July 15 (Monday)

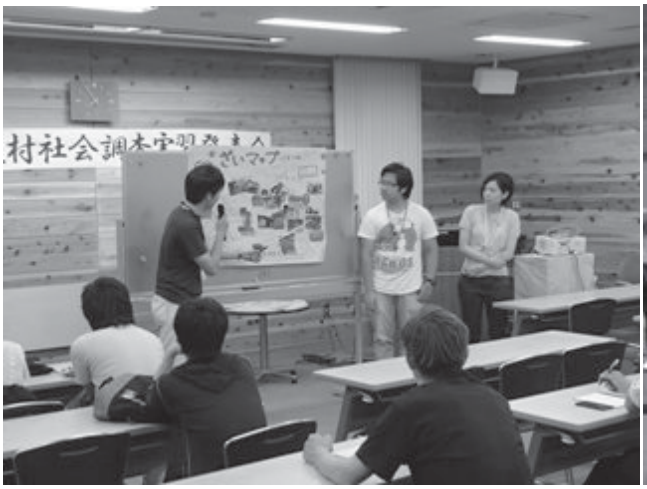
時間 Time	活動 Activity
AM 午前中	Farm work/ Shower 農作業手伝い／シャワー
12:00	Meet at Towa Roadside Station / Lunch 道の駅ふくしま東和に集合～昼食
13:00	Depart by bus/ Reflection 出発／ふりかえり
17:00	Arrive in TUAT Fuchu Campus 府中到着

最終課題 Post-visit Tasks…

- Final Report: Reflective journal – What I learned, felt, and thought in this training and how it will influence my future work レポート A4×1～2 枚「実習を通じて学んだこと・感じたこと・考えたこと、今後に生かしたいこと」





（二ノ宮リムさち・山田祐彰・及川洋征/
Sachi Ninomiya-Lim, Masaaki Yamada, Yosei Oikawa）

6-5. 海外フィールド実習 / Outline of Overseas Field Training

本プログラムにおいては事業の目的の面からも、学生が注がなくてはならないエネルギー量の面からも、最大の重みを有しています。海外フィールド実習は現地調査とその背景の理解に重点が置かれます。学生は、海外フィールド実習とインターンシップの双方の意義付けと計画する活動の内容からいずれかを選択しますが、明確にどちらかに位置づけられないケースもあり、その都度柔軟な対応を心がけてきました。

海外フィールド実習には、学生と指導教員が個別的に実施するものと、FOLENS特任教員が企画してグループで実施するものがあります。前者の多くは、専攻における研究の一環として行われてきた従来からのものと言えます。しかしこれをFOLENSプログラムとして行うことで、他の実習の内容や成果と比べたり関連を考えたりする機会が生じます。一方、FOLENS企画型の実習は、本プログラム開始当初より方向性や目標をどう設定するか議論し、年々、発展してきました。2010年度に海外協力大学（海外教育研究拠点、E&Rベース）であるマレーシアプトラ大学および中国環境科学研究院で行った実習は、参加人数が少なかったことも要因して、従来的な個別内容型の色彩が強かったのですが、2011年度のガーナ実習、2012年度のベトナム実習は、E&Rベースであるガーナ大学およびカントー大学との合同開催を明確にうち出して、コアとなる現地環境問題に参加者が各々の切り口からアプローチし、帰国前に全体を総括する形式になりました。さらに、2013年7～8月にタイ・カセサート大学およびナレスアン大学と実施した実習では、タイへの留学生を含むタイ側学生に加え、マレーシアプトラ大学からの参加も実現しました。こうした経験は、国内学生、留学生ともに就職活動にプラスとなり、卒業後のキャリアパス形成へ貢献していることは確かです。

海外フィールド実習終了後の総括は、国内外インターンシップの総括と合同で、全員からの報告（英語による口頭発表）と質疑応答を行い、各発表項目の関連へと視野を広げて議論しています。これは多岐にわたる環境問題の実例を題材として、一見では関連のない各問題が網目状に関与することを理解し、自身の活動や研究が幅広い環境問題への対策においてどう位置付くかを認識する、新たな機会となっています。こうした議論は、大学院の各専攻や個別の研究室内には無い、FOLENS独自のものであるはずで、俯瞰的視野の育成に有効であると考えられます。学生にとっても、自分の実例により議論が進められるため、興味や具体的な意見を持ちやすく、他の学生との議論により新たな考えにめぐり合う機会となっています。

For the FOLENS program, this training carries the greatest weight in terms of both project objectives and the energy level required from students. The Overseas Field Training places emphasis on field work and understanding the context of findings. Students are required to choose from the Overseas Field Training and Internship. However, depending on the contents, activities cannot always be categorized into one of the two. In such cases, we strive to implement flexibility.

There are two types of Overseas Field Training: the individual type, carried out by students and supervisors, and the group type, planned and carried out by FOLENS through specially appointed faculty members. The former training type has traditionally been offered as part of students' major research. However, by offering this training as part of the FOLENS program, we make available opportunities in which comparisons are made and relevance is studied in relation

to other trainings and their results. Meanwhile, since the launch of this program, the FOLENS-planned training has evolved over the years through discussions on its direction and objectives. In 2010, Overseas Field Trainings were carried out at Universiti Putra Malaysia (UPM) and the Chinese Research Academy of Environmental Sciences, our overseas E&R Bases. These trainings were more similar to traditional individual trainings given the small numbers of participants. However, the training in Ghana in 2011 and that in Vietnam in 2012 were conducted jointly with the University of Ghana and Can Tho University (CTU), our E&R Bases; the participants used different approaches to address core local environmental problems and summarized the trainings before returning to Japan. In the training conducted last July to August 2013 at Kasetsart University (KU) and Naresuan University in Thailand, students from the said Thai universities, including international students, and students from UPM also participated. This experience, without a doubt, was useful for future job hunting for both the Japanese and international students and contributed to the development of their career paths after graduation.

Upon completion, Overseas Field Training programs are jointly summarized with domestic and overseas Internship programs, where all participants deliver oral presentations, answer questions in English, and engage in discussions covering other relevant areas. This activity serves as a new opportunity where students, by using various case studies, understand that seemingly unrelated problems are in fact intertwined. Further, they are expected to recognize how their activities and research projects can be positioned within the broad picture of environmental problems. Such discussions may be unique to the FOLENS programs; that is, they provide experiences not available in isolated majors and laboratories at graduate schools and would help cultivate a bird's-eye perspective in students. It is also an opportunity for students to be exposed to new ideas through discussions with peers, as discussions are built on the students' actual activities and research, thereby helping them form genuine interest and concrete opinions.

（尾崎宏和／Hirokazu Ozaki）

ガーナ・アクラ市の廃棄物処分場で現地学生よりガーナ都市圏におけるゴミ処理方法の説明を受ける/ At a waste disposal facility in Accra, a local student explains the waste disposal system in urban areas in Ghana.

ベトナム実習の総括討論で、カントー大学環境自然資源学部の Nguyen Van Be 教授より教示を受ける / In the summary discussion for the Vietnam field training, students listen to Professor Nguyen Van Be of the College of the Environment and Natural Resources of Can

日本、タイ、マレーシアおよび 3 ヶ国への留学生が参加した 2013 年夏のタイ実習の様子 / Local and international students from Japan, Thailand, and Malaysia participated in the field training in Thailand in the summer of 2013.

海外フィールド実習一覧

（2010年度）

（2011年度）

学生氏名	引率教員氏名	実施月日	訪問先（FOLENS E&R base）	主な実施内容
島田 幸治郎	尾崎宏和	7/11-7/25	マレーシア・UPM	東南アジアにおけるバイオマス燃焼由来微粒子の長距離越境移動のモニタリング
Pheng Sokline	向後雄二	8/4-9/4	カンボジア・水資源気象局	灌漑による土壌浸食と土壌の物理的性質における考察
近藤 圭	渡邊裕純	8/17-8/25	台湾・国立台湾大学、国立中興大学	熱帯気候環境における農薬挙動のモニタリングとモデルの構築
Gong Shaofeng **Zhao Long** **利谷 翔平**	谷口 紳、下ヶ橋雅樹	8/25-9/4	マレーシア・SIRIM Berhad（株）	マレーシア産業における廃棄物とエネルギー管理
Pham Anh Thi Quynh	五味高志	8/25-9/25	ベトナム・ベトナム林業大学	表層土壌浸食に伴った炭素、有機物損失の評価
Roeurn Siranet	平田豊	9/17-9/30	ベトナム・カントー大学	メコンデルタの環境とイネの育種・コメ生産システム
Rinawati	高田秀重	9/26-10/12	インドネシア・ジャカルタ州立大学、ランプン大学	ジャカルタにおける大気および水界底質中の多環方向族炭化水素の起源解析
上原 歩	岩科司	10/12-10/18	中国・中国科学院北京植物園	中国産キク科植物のフラボノイド分析
Li Sen	谷口 紳	10/27-11/5	中国・中国環境科学研究院	中国における土壌汚染修復技術とエネルギーの有効利用
Bessy Kho Sze Ee	木村園子ドロテア	2/16-3/2	ベトナム・ハノイ農業大学	ベトナムChieng Khoi流域における窒素、リンの動態
Ei Ei Theint				コメ生産における物質収支と環境影響 ーベトナム農家の年収額と関連してー
Tungsomkid Jameekorn	斎藤広隆	2/21-3/28	タイ・王立プロジェクト	タイにおける農業および環境問題へ取り組み

学生氏名	引率教員氏名	実施月日	訪問先（FOLENS E&R base）	主な実施内容
青木 和也	寺田昭彦、米田健一	8/31-9/7	タイ・カセサート大学	バンコク・チャオプラヤ川流域における水質汚濁
上村 美羽				
樋口 亮				
沼尻 勇太	尾崎宏和、下ヶ橋雅樹、二ノ宮リムさち、渡邉泉	9/5-9/19	ガーナ・ガーナ大学	アフリカにおける土壌水界環境保全
Rola Samer.O. Mahmoud				
牧田 朋子				
宮崎 雄矢				
Xiao Zhiqiu				
山口 智弘				
Bui Xuan Dung	五味高志	9/5-9/30	ベトナム・ベトナム林業大学	北部ベトナムにおける土壌浸食モニタリングサイトの構築
Antonio Manuel dos Santos Jr.	木村園子ドロテア	9/22-10/1	モザンビーク・エドゥアルド・モンドラーネ大学	家畜による環境インパクトとその緩和手法の考察：モザンビーク南部 Maputo 州 Umbeluzi 地方におけるケーススタディ

（2012 年度）

学生氏名	引率教員氏名	実施月日	訪問先（FOLENS E&R base）	主な実施内容
玄 大雄	なし	6/25-8/3	マレーシア・UPM	大気浮遊微粒子の環境中分布の把握
武藤 元貴	寺田昭彦、米田健一	8/4-8/12	タイ・カセサート大学	バイオエタノール及びバイオディーゼルの活用システム
山田 啓介				廃棄物処分場由来の重金属低減
山本 理博				農業地における土壌中残留農薬の調査とリスク推算

Jollibekov Vladimir	川端良子	8/6–9/27	ウズベキスタン・カラカルパクスタン水利委員会、農業委員会	Karakalpakstan における農産物に対する水質劣化の影響
Piyanuch Jaikaew	渡邊 裕純	8/7–9/7	タイ・カセサート大学	除草剤使用による土壌、表層水、堆積物の汚染解析
嶋田 省吾	Onwona-Agyeman Siaw	8/12–8/26	ガーナ・ガーナ大学	工業用途農産物の生産とその環境負荷
Co Thi Kinh	林谷秀樹、多羅尾光徳、米田健一、尾崎宏和	9/3–9/16	ベトナム・カントー大学、バックマー国立公園、フエ農林大学	メコンデルタ地域の魚加工工場および一般家庭からの廃水水質
Hou Mudan				メコンデルタ表層水の水質分布と浄水処理における課題
Wang Jigemude				メコンにおける浮遊土砂量の推定とデルタの形成
Vo Thi Minh Tam		9/3–10/1		メコンデルタにおける農業・畜産活動に伴う水界への微生物汚染リスク評価
森山浩光		9/3–10/10		ベトナムにおける酪農生産と経済と環境への影響
阿部ちひろ(*)		9/3–10/16		現代ベトナム社会に残るベトナム戦争の影響
塚野 桂	藤井 義晴	9/9–10/9	ブラジル・サンパウロ大学	Tome-acu 地区の森林混在型農業地における主食用農作物間の相互作用
伊東万木	高田 秀重	9/1–9/10	南アフリカ・科学産業研究所	南アフリカにおける残留性有機汚染物質による海洋汚染源の調査
福家 光敏	荻原勲	10/13–20	ベトナム・バックマー国立公園、カント―大学	熱帯果樹の環境保全型生産
陶野 理美	広若 剛(**)	11/26–12/10	インドネシア・西カリマンタン	インドネシア西カリマンタンの地域開発におけるココナッツの多用途利用

Li Zhenhao	藤井　義晴	2/17-3/24	中国・武漢、華南、雲南各植物園	中国南部および南西部地域におけるアレロパシー植物の探索

（2013 年度）

学生氏名	引率教員氏名	実施月日	訪問先（FOLENS E&R base）	計画内容・備考
松下朋永	米田　健一、寺田昭彦、尾崎宏和	8/5－8/16	タイ、カセサート大学 ごみ処分場 ﾊﾞｲｵｴﾀﾉｰﾙ・ﾊﾞｲｵﾃﾞｨｰｾﾞﾙ実用化 下水処分場等	発展途上国における紙ごみ問題とペーパーレス化
Song Kang		7/28－8/11		タイにおける下水処分場の温暖化ガス（N_2O）排出量推算
Tang Si Hiep		7/28－8/21（8/10 よりベトナム）		タイおよびベトナムにおける下水処分場の温暖化ガス排出に関する比較検討
竹村　龍一		7/28－8/16		レーザー式検出器による廃棄物処分場のメタンガス測定
志村 芙美		7/28－8/11		タイ下水処理施設の GHG 排出と微生物の関係
八百多佳実		7/28－8/11		ガソリン添加用バイオエタノールからの水素製造と家庭用非常電源への応用
Harakhun Tanatavikorn		7/28－8/16		廃棄物処理に関するタイ、日本、欧米の比較調査
Bao Qian		7/28－8/10		タイの下水処理場におけるアンモニア酸化菌バイオマス
梅津　沙緒里		7/28－8/16		レーザー型測定器による下水処理場、処分場及び田圃からのメタン排出量測定

Mardan Korrani Hossein	藤井　義晴	8/1－9/1	ロシア、コーカサス地方	コーカサス地方におけるアレロパシー植物の探索（短期コース終了後のElena が現地補佐）
Nguyen Giang Nam	（単独渡航）	8/1－9/19	ベトナム、カントー大学	メコンデルタ沿岸地域における地下水の水文・環境評価
長谷川 瑞貴	林谷　秀樹	8/5－8/18	タイ（上記に一部参加）	タイにおけるサルモネラ菌感染源の探索
Sviridova Nina	金子やよい	8/11－8/24	イギリス、オクスフォード大学	森林に棲息する陸上哺乳類の保護
細田 隼基	高田　秀重	9/1－9/10	モザンビーク、エドゥアルドモンドラーネ大学	難分解性有機汚染物質によるモザンビークの沿岸海洋汚染
永田　絵美	林谷　秀樹、Onwona-Agyeman Siaw	9/23－10/6	ガーナ大学獣医学科	ガーナにおける家畜医療とヤモリのサルモネラ菌の探索（仮）
松浦江里			ガーナ大学	ガーナ農業の伝統システムと持続性に関する検討
Mishyna Maryia	藤井　義晴	10/29－11/15	オーストラリア、チャールズ・スタート大学	オーストラリア・ニューサウスウェールズにおける雑草の生存戦略
Thiam Magatt	向後　雄二	11/24－29	タイ	バンコクにおける地下水の水質測定
武藤　啓	斉藤　広隆			地中熱利用の可能性探査を目的とした地下水温度分布の測定
Lorn Vicheka	田中　治夫	2014/1/22-2/6	カンボジア	カンボジアの農用地土壌の特性および農民の生活実態の調査
Mohammad Sahin Polan	（単独渡航）	2014/2/22-3/1	マレーシア、UPM	マレーシアプトラ大学周辺における農薬による環境汚染とくに残留性有機物に関する調査
加賀芳恵	降旗　信一	2014/2/10-14	韓国、ソウル大学	災害復興と防止、歴史文化の理解、生物多様性等に関する環境教育の多面的役割

Rahman Md. Hasnat	船田 良	2014/2/26 -3/6	インドネシア、ガジャマダ大学	熱帯樹木の木部形成に関する環境問題および環境政策の関与

A list of overseas field training

FY2010

Student	**Supervizer with the student**	**Period (MM/DD)**	**Main destination (E&R bases underline)**	**Topic / Theme**
Kojiro Shimada	Hirokazu Ozaki	7/11–7/25	Malaysia/ UPM	Observation of forest fire, peat burning and transported from Southeast Asia and fossil fuel combustion in Malaysia
Pheng Sokline	Yuji Kohgo	8/4–9/4	Cambodia/ Ministry of Water Resources and Meteorology	Investigation on soil erosion at irrigation facilities and mechanical properties of soil sample in Cambodia
Kei Kondo	Hirozumi Watanabe	8/17–8/25	Taiwan/National Taiwan University and National Chung Hsing University	An exercise of modeling and monitoring for pesticide fate and transport under the tropical meteorological condition in Taiwan
Gong Shaofeng	Shin Taniguchi and Masaki Sagehashi	8/25–9/4	Malaysia/ SIRIM Berhad	Waste and energy management in Malaysian industry
Zhao Long				
Shohei Riya				
Pham Anh Thi Quynh	Takashi Gomi	8/25–9/25	Vietnam/ Vietnam University of Forestry	Evaluation of sediment and carbon losses associated with soil surface erosion
Roeurn Siranet	Yutaka Hirata	9/17–9/30	Vietnam/ Can Tho University	Study on the rice breeding and production system and environment condition in Mekong Delta, Vietnam
Rinawati	Hideshige Takada	9/26–10/12	Indonesia/ State	Sources identification of sedimentary and atmospheric PAHs

			University of Jakarta and Lampung University	in Jakarta, Indonesia
Ayumi Uehara	Tsukasa Iwashina	10/12–10/18	Beijing Botanical Garden, Chinese Academy of Sciences	Collection of Chrysanthemum sensu lato species in China as plant materials, for flavonoid analysis
Li Sen	Shin Taniguchi	10/27–11/5	China/ Chinese Research Academy of Environmental Sciences	The investigation of treatment technology of soil pollution and efficiency usage technology of energy in China
Bessy Kho Sze Ee	Sonoko Dorothea Kimura	2/16–3/2	Vietnam/ Hanoi University of Agriculture	Nitrogen and phosphorus movements in Chieng Khoi Watershed in Vietnam
Ei Ei Theint				Eco-balance analysis on rice cultivation systems related with environmental impacts and farm income
Tungsomkid Jameekorn	Hirotaka Saito	2/21–3/28	Thailand/ Royal Project	Agriculture and environmental management in Thailand

FY2011

Student	**Supervizer with the student**	**Period (MM/DD)**	**Main destination (E&R Bases underline**	**Topic / Theme**
Kazuya Aoki	Akihiko Terada and Kennichi Yoneda	8/31–9/7	Thailand/ Kasetsart University	Water quality degradation in Chao Phraya River Basin in Bangkok
Miu Kamimura				
Ryo Higuchi				
Yuta Numajiri	Hirokazu Ozaki, Masaki	9/5–9/19	Ghana/University of Ghana	Soil and water conservation in Africa: Modern agriculture and gold mining in Ghana
Rola Samer.O. Mahmoud				

Tomoko Makita	Sagehashi, Sachi Ninomiya-Lim and Izumi Watanabe			
Yuya Miyazaki				
Xiao Zhiqiu				
Chihiro Yamaguchi				
Bui Xuan Dung	Takashi Gomi	9/5-9/30	Vietnam/ Vietnam University of Forestry	Developing a monitoring station for runoff in northern catchment of Vietnam
Antonio Manuel dos Santos Jr.	Sonoko Dorothea Kimura	9/22-10/1	Mozambique / Eduardo Mondlane University	Environmental impacts of livestock activity and mitigation options: a case study of Umbeluzi region, Maputo province, southern Mozambique

FY2012

Student	**Supervizer with the student**	**Period (MM/DD)**	**Main destination (E&R Bases are shown with underline**	**Topic / Theme**
Gen Masao	-	6/25-8/3	Malaysia/ UPM	Assembly of a particle collection system with high mobility to understand atmospheric particles in Malaysia
Muto Genki	Terada Akihiko, Yoneda Kenichi	8/4-8/12	Thailand/ Kasetsart University	Bio-ethanol and bio-diesel using system
Yamada Keisuke				Reduction of heavy metal in the disposal ground
Yamamoto Masahiro				Research of residual pesticide in soil and evaluation of the risk in agricultural area
Jollibekov Vladimir	Kawabata Yoshiko	8/6-9/27	Uzbekistan/ agricultural committee, Karakalpakstan	Water quality impacts to agriculture products, Case study in Karakalpakstan, Uzbekistan
Piyanuch Jaikaew	Watanabe Hirozumi	8/7-9/7	Thailand/Kasetsart University	Investigation of herbicide usage and consequent contamination in upland soil and surface water in Petchaburi

				Province of Thailand
Shimada Shogo	Onwona-Agyeman Siaw	8/12-8/26	Ghana/University of Ghana	The environmental impacts and the future of industrial crop production in Ghana
Co Thi Kinh	Hayashidani Hideki, Tarao Mitsunori, Yoneda Kenichi, Ozaki Hirokazu	9/3-9/16	Vietnam/ Cantho University, Bachma National Park, Hue University of Agriculture and Forestory	Study on quality of wastewater from fish processing factories and household wastewater in the Mekong Delta
Hou Mudan				Study on surface water quality in the Mekong Delta of Vietnam
Wang Jigemude				Suspended Sediment Transport in Mekong River
Vo Thi Minh Tam		9/3-10/1		Agriculture activities and the risk of microbiological pollution in aquatic environment in Mekong Delta Vietnam
Moriyama Hiromitsu		9/3-10/10		Study on dairy industry and its impact on economics and environment in Vietnam
Abe Chihiro(*)		9/3-10/16		Vietnam today, with experience of The Vietnam War
Tsukano Katsura	Fujii Yoshiharu	9/9-10/9	Brazil/ University of Sao Paulo	Interaction of staple plants in Agroforestry system(SAFTA) in Tome-acu
Itoh Maki	Takada Hideshige	9/1-9/10	South Africa/ Council for Scientific and Industrial Research	Sediment core sampling in South Arica
Fuke Mitsutoshi	Ogiwara Isao	10/13-20	Vietnam/ Bachma National Park and Cantho University	Current situation of cultivation methodologies for horticultural crops on rainy season in Mekong delta and Bach Ma National Park focused on the balance of advanced agricultural technologies and environmental consciousness
Tono Rimi	Hirowaka Tsuyoshi	11/26-12/10	Indonesia/ West Kalimantan	Examining rural development through multipurpose uses of coconut in

				West Kalimantan, Indonesia
Li Zhenhao	Yoshiharu Fujii	2/17–3/24	China/ Wuhan, South China, Yunnan Botanic garden	Find out allelopathy plants from South and South-West China

FY2013

Student	**Supervizer with the student**	**Period in2013 (MM/DD)**	**Main destination (E&R Bases are shown with underline**	**Topic / Theme**
Tomohisa Matsushita	Kennichi Yoneda, Akihiko Terada and Hirokazu Ozaki	8/5～8/16	Kasetsart University, Thailand	Paper wastes and paperless in developing countries
Song Kang		7/28～8/11		Study on N2O gas and other GHG emission from sewage treatment plant in Thailand
Tang Si Hiep		7/28～8/21		Study on greenhouse gas emission from sewage treatment plant in Thailand and Vietnam
Ryuichi Takemura		7/28～8/16		Measurement of methan gas distribution using laser methane detector in Landfill site in Thaoland
Fumi Shimura		7/28～8/11		GHG emission from sewage treatment plant in Thailand, focusing on microorganisms
Takami Yao		7/28～8/11		Investigation on hydrogen production from bio-ethanol for household in emergency in Thailand
Harakhun Tanatavikorn		7/28～8/16		Comparative investigation on municipal solid waste management in Thailand, Japan and Europe
Bao Qian		7/28～8/10		Study on biomass of Ammonia-Oxidizing-Bacteria in sewage treatment plant in Thailand
Saori Umetsu		7/28～8/16		Measurement of CH4 emission from sewage treatment plant, landfill and

				rice field with laser type sensor
Mardan Korrani Hossein	Yoshiharu Fujii	8/1～9/1	Caucasus, Russia	Screening of North-West Caucasus plant species for allelopathic activity
Nguyen Giang Nam	–	8/1～9/19	Can Tho University, Vietnam	Environmental and hydrological assessment of groundwater in coastal area of Mekong Delta, Vietnam
Mizuki Hasegawa	Hideki Hashidani	8/5～8/18	Kasetsart University, Thailand (partially joined to the above)	Studies for the source of infection of Salmonella in Thailand
Sviridova Nina	Yayoi Kaneko	8/11～8/24	Oxford University, UK	Forest wildlife conservation studying from point of view of terrestrial mammals
Junki Hosoda	Hideshige Takada	9/1～9/10	Eduardo Mondiane University, Mozambique	Coastal marine pollution of Mozambique by persistent organic pollutants
Emi Nagata	Hideki Hayashidani and Onwona-Agyeman Siaw	9/23～10/6	University of Ghana	Search of salmonella gecko and livestock care in Ghana（仮）
Eri Matsuura				A study on traditional system and sustainability of agriculture in Ghana
Mishyna Maryia	Yoshiharu Fujii	10/29～11/15	Charles Sturt University, Austrelia	Implementation Australian Weeds Strategy (AWS) in New South Wales, Australia
Thiam Magatt	Yoji Kohgo	11/24～29	Thailand	Field investigation of ground water quality in Bangkok
Hiromu Muto	Hirokata Saito			Measurement of groundwater temperature distribution for the potential exploration for subsurface heat source
Lorn Vicheka	Haruo Tanaka	2014/1/22-2/6	Cambodia	Survey on Agricultural Soil Characteristics and Farmer's Livelihood in Cambodia

Mohammad Sahin Polan	–	2014/2/22 –3/1	UPM	Survey of environmental pollution caused by pesticide, specially POPs in the area near University Putra, Malaysia
Yoshie Kaga	Shinichi Furihata	2014/2/10 –14	Korea	Multi-functional role of environmental education on biodiversity, reconstruction from and prevention of disaster, understanding of the history and culture
Rahman Md. Hasnat	Ryo Funada	2014/2/26 –3/6	Gadjah Mada University, Indonesia	Study on environmental degradation, management and wood formation process in subtropical trees

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Observation of forest fire, peat burning and transported from Southeast Asia and fossil fuel combustion in Malaysia.

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The United Graduate School of Agriculture
Department of Symbiotic Science of Environment and Natural Resources
Major Chair of Environmental Conservation

Key words: Aerosol, making team, communication ability, air pollution, cooperation

(1) Contents and activities during the overseas field training (less than 600 words)

This oversea field training was carried out in University Putra Malaysia (UPM) in Malaysia. The counter partner in Malaysia was Assoc. Professor Dr. Mohammad Pauzi Zakaria. For this overseas field training, my main objective was to install the low volume sampler to take Particle Matter 2.5 μm and high volume sampler to take Particle Matter 7 μm using cut filter to observe air pollution in the city and Haze as a biomass burning transport from Indonesia. Then, after I get the date in Malaysia, I would like to learn that field-oriented leader should have the sense or ability to see how matters stand.

The observation term is due for one year. I planned to use the two equipments to take a daily sample in differences sizes like fine and coarse particles this month and in dry seasons like July for one month. On the other hand, low volume sampler is used to take weekly samples in fine particle. It took me five days to install the low volume sampler and high volume sampler. It was very difficult to determine the observation site and install these equipments for the observation in atmospheric chemistry.

After installing these equipments, I started to observe air pollution materials such as aerosols using two equipments at the same time for one month as intensive observation. But I stopped stop observing it after a while, because the weather was not suitable and there was frequent rain even though July is suppose to be dry season under normal circumstances in Malaysia. If there was any trace of Haze or air pollution, they should be deposited by the rain. The change from dry to wet season is mainly caused by the phenomena La Nina. So I changed the intensive observation term from July to October. And in July, I took a sample once a week.

Secondly, my objective was to make a team consisting of three members. I was advised by Prof Oikawa regarding the necessity of making a team, mainly because it was easier for me to acquire the ability

to adapt to situations and try to elevate my communication ability in English. In addition, the duration of this training is only two weeks which is quite short. Since it was necessary for me to run my observation for a year, I needed to create a team to run the observation for a year. I taught them to set and recover the filter and how to use these equipments in one week.

Thirdly, I visited Malaysian Meteorological Department (MMD) and two EANET sites during my visit. My objective was to get the information of air pollution in Malaysia. Before the visit, I discussed with my teammates about questions to ask, because it was most difficult for me to understand MMD's explanations in English immediately. I spend a lot of time understanding air pollution in Malaysia through their cooperation.

Finally, regarding sending the samples, I arranged for the delivery system to handle the samples as frozen goods from Malaysia to Japan. I visited Yamato Malaysia. The objective was to understand the different services offered to send packages between Japan and Malaysia, and negotiated with them to send the packages between the Universities. Actually, Yamato do not provide the service to keep the package as frozen goods and send the package to University from Japan to Malaysia as export. In this negotiation, I could send the package as frozen goods if possible to Japan from Malaysia, and send the package as export to Malaysia from Japan between universities.

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

Regarding setting up the low volume sampler and high volume sampler in UPM, in the beginning, I thought that the work culture in Malaysia was similar to that of Japan's. But, actually, I did not know a great deal about Malaysia, such as that there are many thunderbolts in Malaysia. So I could not have done it without their help there.

I also learned many things from them in Malaysia. There is no doubt that in order to get along in a global community, it is necessary to be good at a foreign language (English, Malay, Chinese). However, I realized that it is even more important to behave in a responsible way and with enough common sense so as to not bother others. Though I could not fully understand their English, I could still clearly sense the impression of their cooperativeness, high social ability as well as the feelings they were trying to convey. Through this project, I was able to learn how to be an international minded researcher.

I think that a field-oriented leader should have the sense or ability to see how matters stand. Although, in this training, I focus more on atmospheric pollution, in Malaysia, most of the areas are quite clean. I would like to put this experience to use as a field-oriented leader in environmental sectors in Asia and Africa in my doctor course study. I think that Japan have experience atmospheric pollution, produced environmental standard value and, in addition, is facing a new problem which is transboundary air pollution like Asian dust (Ministry of the Environment Government 2009) with atmospheric pollutions. In other words, we have experienced it and are exposed to technologies that evaluate atmospheric pollution which allows for public administrations in these grounds. I think this is my strong point. Malaysia is yet to face problems like atmospheric pollution. But I think Malaysia would face such problems in the near future, because Malaysia's economic have been growing since 1990 (Malaysian Industrial Development Authority 2010), as a result,

Malaysia is expected to face problems from a historical viewpoint like the London smog and Los Angeles smog (Fowler 2010). But in Malaysia, there are few scientists who concentrate on atmospheric pollution and there is an absent of technologies which analyze chemical composition to evaluate atmospheric pollution. This is because, since Malaysia has never faced these problems, they are not incline to get it.

I experienced clean air in Malaysia during my visit. If Malaysia should face problems like these, I could cooperate with Malaysians researchers to solve the problem from a scientific viewpoint.

I also expect that a slightly different kind of atmospheric pollution will occur in Malaysia compare to Japan. This is mainly because it depends on source origin, and air pollution caused by oxides of nitrogen et al., is from different climate condition between Japan and Malaysia.

Through this training, I will try to investigate it. So far, there is no report in the tropical region like Southeast Asia. I think I could contribute to Malaysia from a scientist's viewpoint.

(3) Achievements and its future vision (less than 400 words)

In this program, I expected to visit unfamiliar places and acquire the ability to adapt to situations. In a foreign country, the language, culture, law, climate and etc are different. Furthermore the people's mentality is very much different from ours. I would like to learn sampling out in the fields especially in other countries where things are different as well as experience its difficulty. I think specialists only concentrate on what they specialize in and over time, they become less flexible when it comes to other tasks. But generalists can easily adapt to the environment they're in and get by with what they have in a situation. This ability can be applied to many situations. Through this program, I hope to experience sampling in foreign countries in order to raise my communication skills and adaptability.

Actually, during my stay in Malaysia, I had the opportunity to experience communication in English. As a result, it is now easier for me to communicate and present in English at societies.

Regarding sampling in the fields, there are numerous differences between Malaysia and Japan. I would apply for a second visit to Malaysia so that I can cooperate with Malaysian students or academics to study about atmospheric pollution. I could then also share my experience with people back in Japan. I apt to be a researcher who could obtain data through collaborations without going out into the field so much. I feel that it is difficult to understand pollution conditions based on actual situations when I'm not familiar with the place. If I investigate the pollution's source origin from obtained data only, there might be misinterpretation of the source origin. I should judge based on the data and actual situations. Should I make public administrations on these grounds, I think I should come up with regulations to control it only after understand the place's circumstances. Being able to read situations and act accordingly are skills which I should possess in order to be a field-oriented leader.

Through this program, I hope to be able to be a more generalized expert who is familiar with many fields, and contribute to the policy of the government.

I also visited MMD and two EANET sites during my visit. I hope that once I get the result, I would like to discuss about this data with EANET in Japan. Then, I would like to cooperate the MMD through this program.

(4) Acknowledgement

There were many parties involved in this Oversea Field Training of which it would not have been a success without their kind help. First and foremost, I would like to express my sincere gratitude to Assoc. Prof. Dr. Mohammad Pauzi Zakaria for his total support and overall hospitality throughout my stay. I would also like to acknowledge Miss Maybelline Yeo and Mr. Muhammad Raza for aiding me through most of the activities and tending to me during my stay. Also, a warm thank you to Assoc. Prof. Dr. Mohammad Pauzi Zakaria's students at CoE for accommodating my stay and making sure that I was never bored. Last but not least, I would like to specially mention Dr. Ozaki for a great job coordinating this Oversea Field Training.

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(Supervised by Hirokazu Ozaki)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Investigation on Soil Erosion at Irrigation Facilities and Mechanical Properties of Soil Sample in Cambodia

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Key words: erosion, irrigation facilities, soil-cement stabilization, cost reduction

(1) Introduction

This document is a synthesis of the major findings in a study on the soil erosion of irrigation facilities and mechanical properties of soil sample in Cambodia. The main objectives are, to investigate the condition of irrigation facilities in Cambodia and obtain some mechanical properties of soils. This overseas field training, funded by FOLENS program, was carried out in August 2010 by cooperation with Technical Service Centre Phase III, Ministry of Water Resources and Meteorology. Two sites are selected for this investigation.

The first site is located in Kandal Steung district of Kandal Province, between the east of national road number 3 and the west of the national road number 2 and is far from 30 km south of Phnom Penh. The command irrigation area covered by Kandal Steung site is approximately 560 ha, and the total command areas is 1950 ha, which covered 31 villages, are project beneficiaries, with a total of 3499 households and 16288 people (JICA, 2010). The main sources of income are rice production, labour and livestock. The primary water supply sources for wet season rice and other crops are rain water and Kandal Steung canal stream. The secondary water sources are shallow wells, ponds, for irrigating other crops in dry season.

The second site is in the North of Daun Keo town, about 13 km of Takeo town, Takeo province. The command irrigation area covered by Thomney site is approximately 301 ha, with two beneficiary administrative villages. The main water supply sources for wet season rice and other crops are rain water and Thomney reservoir. The secondary water sources are existing canal during Pol Pot regime, for irrigating other crops in dry season. Most people are farmers and rice production is the main income source. There is Farmer Water User Committee (FWUC), established in 2004, in this model site. The aim of FWUC is to ensure the sustainability of irrigation facilities. It responses for water distribution, water fee collection for maintenance, receive and spread all information to farmer water user group.

During the overseas field training, erosion length, depth and width which occurred along the canal bank were measured by sketching the distance along the bank canal. Besides crack measure, mechanical properties test for soils sample were also conducted during field investigation. At the sites, soil samples were taken for experiments in laboratory where some of the fundamental soil tests were practiced.

Figure 1: Canal bank erosion at model sites

Size of Erosion (Kandal Steung site)	Width (cm)	Depth (cm)	Length (cm)
Sketch I	42.8	23.2	163.6
Sketch II	21.8	7.4	140

Table 1: Sketched for erosion measure

In order to observe the erosion width, depth and length, we sketched the distance along the canal bank by dividing into many part. We started to measure from 500 cm till 5000 cm. The values in table are the average ones that we obtained by sum-up the size of

Figure 2: soil density test

(2) Findings and Achievements Obtained

From the inventory in 1997, there were 950 irrigation schemes in Cambodia identified mostly built during Pol Pot regime. Among 950 irrigation schemes, only 20% are still functional, 14% are not, and the rest is partly functional (Jeffrey, H. 2002). The irrigation facilities in Cambodia are very limited. There are many major problems of irrigation systems in Cambodia. They are lack of irrigation structures, lack of comprehensive rehabilitation work and deteriorated irrigation facilities. At the model sites, deteriorated irrigations facilities are mainly occurring.

Tertiary canal embankment broken and shallow water table is one of common problems occurred at these sites. All of the tertiary canals, there are tail structures so water is not saved and the canal banks are easily eroded. Erosion is mainly found along the canal banks. The progressive bank erosion is now threatening these project sites. Due to the fact that erosion has occurred, it is the big constrain on water distribution in the command irrigation areas. Poor water distribution is the major cause of decreasing agricultural production and activities, abandon the cultivated land. Erosion in irrigation facilities lead to the high maintenance cost to rehab or construct the new structures. It is the major issue which makes the concern for farmers and the government. Based on the field investigation, poor structures material, seepage and high permeability of the engineering material, are the major causes of bank erosion.

Figure 3: Canal structure failure at irrigation model site

Improving the engineering material, therefore, plays an important role to mitigate canal bank erosion in these project sites. Conventional structures using hard materials, concrete, are best erosion mitigation. The government and farmers, however, cannot afford to construct it, due to its high construction cost.

There are some appropriate alternatives which are proposed by Technical Service Centre and local authority. The proposed measures provided a passive and adaptive approach to managing canal bank erosion by applying the brick on the slope and cover by mortar. Another alternative solution for erosion protection is stabilization using soil-cement component material which is found at second model site, Takeo province. It is made by mixing the soil from the paddy field, fine sand, and cement. This would reduce the risks of severe attack resulting in structure failure and high maintenance costs. These alternatives can reduce about half the cost of conventional hard materials and have the advantage of using soil at the field site and labour.

Figure 4: Admixture of soil-cement component material

Soil-cement component material is considered as the best alternative for canal bank protection. One of the main advantages of soil-cement can make the construction costs lower that is the big constrain for poor community. Another benefit, it is environmental friendly and save much time by using soil at the construction sites. However, there is a concern about its strength. Soil cement component material is made by mixing with soil on site, so it is difficult to ensure whether it has consistent strength as in the case of concrete, and its strength may fluctuate according to its water content and the grain size distribution of soil mixed. Investigation on the strength of soil cement component material is highly required in order to make sure the effectiveness of soil-cement component material for erosion protection in irrigation facilities.

(3) Achievements and its future vision

Due to the excessive investment of maintenance costs, and the lack of sufficient irrigation facility capacity; new methods has to be sought and new building materials has to be introduced. Thus, the decision maker should take a look for the sustainable construction with cheap investment cost. Since the building materials, soil propertied and the development of soil mechanic, are improving to the high level than previously, the characteristics of in-situ soil using certain treatment enable us to render soil suitable for engineering purposes.

The best demonstration of soil-cement component material has been the satisfactory performance by treating natural soils, residue soil, or by the addition of certain materials to the soil, we can produce new substances which, if correctly built-in and maintained, will permanently resist soil erosion and seepage. It, therefore, can be considered as stable and suitable for most of the projects in the face of its worsening financial situation.

(4) Acknowledgement

I wish to express my deepest thanks to Dr.Kohgo for providing me important advice and help. I also express my appreciation for FOLENS staffs for great facilitation and support. Further gratitude is expressed to Mr.Nagai, Mr. Watanabe, Mr.Hing and all TSC's staff for their assist at the research field. Also thanks to Laboratory's staff of Department of Civil Engineering at Ministry of Water Resources and Meteorology for helping me during my experiments. Foremost, I express great appreciation to FOLENS program that provided this precious opportunity for me to enhance my knowledge and financial support.

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(Supervised by Dr. Yuji Kohgo)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

An exercise of modeling and monitoring for pesticide fate and transport under the tropical meteorological condition in Taiwan

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Destination: Taiwan, Period: August 17-August 25

Key words: pesticide, paddy field, kinetics, double-crop season, uncertainty

(1) Contents and activities during the overseas field training

Rice production is major agricultural practice in Taiwan, as well as in Japan and the other Monsoon Asia countries. In Taiwan, double-cropped rice cultivation is usually practiced and the first crop is cultivated in February and harvested in July, and the second crop is cultivated in August and harvested in December. According to Agriculture, Forestry, Fishery, and Husbandry Census by National Statistics, republic in China (Taiwan) in 2005, nearly 50% was shared by rice cultivation among the agricultural industry in Taiwan. Recently, shortage of work force due to aging of the farmer's population and increase of the number of part-time farmer is pointed out. From this circumstance in Taiwan, contract farming is commonly adopted to overcome above issue and implementation of this measure enable farmer to mechanize their agricultural practice (Higashiyama et al, 2009). As a result, agricultural profitability in Taiwan is well maintained. On the other hand, use of agrochemicals such as pesticide and fertilizer seems to be popular practice and indeed, these agricultural chemicals were applied over about 75% of total agricultural area. Generally, surface runoff of pesticide into aquatic environment is said to be highly dependent on physicochemical properties of pesticides, meteorological condition, and farmer's water management. Furthermore, about 75% of average annual rainfall occurs between May and October (Fig.1) (Ok et al, 2010). From these points of

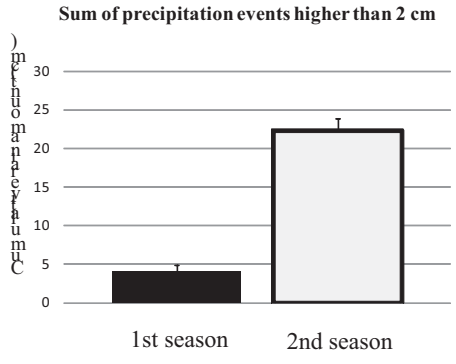

Fig. 1 Cumulative rainfall amount for sum of precipitation events higher than 2cm for 10- years (Ok et al, 2010)

view, pesticide exposure issue towards drinking water safety and toxicity for aquatic life in Taiwan is important issue. In general, non-point source pollution such as pesticide use in paddy field should be discussed with exposure risk and its endpoint like EC50 and LC50. However, current deterministic approach is difficult to assess the actual exposure risk including above factors. Therefore, probabilistic risk assessment (PRA) incorporating Monte Carlo technique using simulation model is recommended to use for this task. To accomplish PRA for pesticide exposure assessment in Taiwan, following objectives were set in this field training.

1. To design laboratory and field experiments and simulate their results using simple kinetic model to obtain physicochemical parameters of target pesticide with a consideration of double-crop cultivation in Taiwan
2. To develop whole water management scenario of double crop rice production including non-irrigated periods in Taiwan.

During the field training, we preceded our investigation based on following schedule. We first went to National Taiwan university located in Taipei (Fig.3). In there, we visited two laboratories, pesticide environmental toxicology laboratory (Dr. Jui-Hung Yen) (Fig.4) and Biosystems Modeling and Control Laboratory belonging Department of Bioenvironmental Systems Engineering (Dr. Chung-Min Liao). We discussed experiment results and exchanged information on how we can perform and investigate pesticide behavior under the condition assumed Taiwan's meteorological condition in Japan at the first laboratory. Meanwhile, at the second laboratory, we joined the discussion to debate about PRA exchanging individual achievements and discussed what kind of information or techniques are required for our future progress. Also, we walked around the food market and night market to investigate actual situation of Taiwan's market during the stay in Taipei. After that, we moved and stayed at Taichung until last day. Main purpose in there was that we discussed above objectives with Laboratory of Weed Science and Herbicide (Dr. Ching-Yuh Wang), Department of Agronomy, National Chung Hsing University (NCHU) (Fig.5,6). In addition to this, we visited Agricultural Research Institute, Council of Agriculture, Executive Yuan to investigate experimental paddy field(Fig.7,8) and some commercial agricultural fields. Field observation at commercial paddy field was canceled because we could not get allowance from farmer.

Fig. 2 Map of Taiwan and its main city location

Fig.3 National Taiwan University

Fig.4 Meeting with pesticide environmental toxicology laboratory

Fig.5 National Chung Hsing University

Fig.6 Meeting with Laboratory of Weed Science and Herbicide

Fig.7 Agricultural Research Institute, Council of Agriculture, Executive Yuan

(2) Findings and achievements obtained, significant experiences and lessons

Here reporter explains own achievements, experiments, and lessons through this field training regarding two aspects, technical aspect and leadership as a field-oriented leader in environmental sectors towards future study of master course.

First, pesticide fate and transport monitoring and modeling in Taiwan's paddy field are explained here. Basic designation of paddy fields in Taiwan seemed to be almost same as that in Japanese (Fig.9), which irrigation and drainage canal were basically separated and each plot was divided by levee made from soil or concrete. At many plots and side wall of canals, apple snail which was imported from South America as food and was applied paddy field to control paddy field recently but concerned damage of young rice plant by them simultaneously was observed. Paddy water penetration did not much seem to affect pesticide leaching into ground water because paddy soil in Taiwan was contained sufficient clay and silt and this soil seemed to be brought from somewhere else around the paddy fields (Fig.10). Meanwhile, pesticide management practices such as water holding practice after pesticide application which famer tries not to irrigate and drainage into paddy plot during this period was not much spread compared to Japan (Fig.11). This might be because temperature control in paddy plot was prior factor for famers and irrigation and drainage practice were more important practices to increase yields (Fig.12). From these actual surroundings, we found that pesticide surface runoff was more significant factor for pesticide exposure issue. Therefore, our final goal is to mitigate pesticide exposure impact for aquatic environment. Our first step for this was implementation appropriate monitoring and verification of its results using simulation model. Since the corroborative research group has different major from us, results conformation was far from smoothly. The important points of this discussion were that we should not just claim our own opinion but accept our companion's opinions and supplement what was not special in individual major each other and discuss topics based on common technical knowledge using appropriate English words. In this flavor, practical English skill is essential especially for us, a field-oriented leader in environmental sectors because almost all Asian people including us are not native speaker of English, so our companions are not always good at speaking English. Therefore, we, field-oriented leaders in environmental sectors have to learn well-skilled English to adjust the speaking level responding the

Fig.8 Field observation at Agricultural Research Institute, Council of Agriculture, Executive Yuan

Fig.9 Experimental paddy field at Agricultural Research Institute, Council of Agriculture, Executive Yuan

Fig.10 Paddy soil at Agricultural Research Institute, Council of Agriculture, Executive Yuan

situation appropriately.

Secondly, discussion of PRA with members of Biosystems Modeling and Control Laboratory in National Taiwan University is described. Because PRA framework was developed recently and inside of structure was also complicated compared to a deterministic scheme, it was difficult to communicate with the results from PRA. PRA has the characteristic that lack of knowledge of researcher directly expands the uncertainty of investigated results. From these reasons, discussion with Biosystems Modeling and Control Laboratory was really good chance to learn and complement the technique of PRA. The history of this discussion was that first we found the activities of Biosystems and Control Laboratory on the Internet web page of this laboratory. In their homepage, most of their achievements such as publication were available so that we could download and check their publications easily, then finally got chance to contact with them.

Finally, the most important thing in environmental sectors for leadership was voluntary activities. Suppose we have sufficient knowledge to assess the environment issue for developing countries like Asia and Africa, we cannot help anything without from native people. Thus, we, field-oriented leaders in environmental sectors are required not only the ability to work on environmental issue but also to advertise ourselves and to build the network for research corroboration.

Fig.11 Investigation of drainage gate management

Fig.12 Paddy water drainage

(3) Achievements and its future vision

Through this field training, a task which was a part of research collaboration with NCHU was assigned. The detail was to create kinetic parameters estimation program using Microsoft Excel® to obtain specific pesticide parameter under the Taiwan's meteorological condition. After research team at NCHU finish their experiments, we can easily calculate parameters using this program from their experiment result. Also, we plan to create the documents what we've done each other so that we can learn individual major. From these processes, how international collaborative research proceeds is expected to learn. For PRA part, we will keep in touch with Biosystems Modeling and Control Laboratory in National Taiwan University and

when we publish article, we will send it to them so that we keep good connection with them. This conduct can be expected to lead to future research collaboration to work on common environmental issues.

Through all these current progresses, the reporter expected to learn own advertisement like how let foreign people know own achievements and ability and how to promote research collaboration with foreign researcher especially in developing country. Currently, researcher's activities, abilities, and publication are shared though the Internet world wide scale joins the mainstream gradually. However, communication and research collaboration only by the Internet is not appropriate and have possibility to cause misunderstanding. Hence, to visit and debate with research companions directly will become more important. At this situation, voluntary activities are certainty required and we, field-oriented leaders in environmental sectors, should be the first to promote.

<Future vision>

For the future, what I plan to contribute to environment issues as field-oriented leader is that I spread appropriate usage of agrochemicals especially pesticide to local agricultural governor or farmer and remove the threat of chemical use from resident people so that I can support more efficient and sustainable aquiculture.

(4) Acknowledgement

I appreciate Dr. Jui-Hung Yen and Dr. Chung-Min Liao at National Taiwan University and Dr. Ching-Yuh WANG at National Chung Hsing University for arrangement of meeting session and field observation.

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(Supervised by Hirozumi Watanabe)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

The Waste and Energy Management in Malaysia Industry

Shohei Riya
1st Grade of Doctoral Course, Department of Chemical Engineering
Graduate School of Engineering
Destination and period: Plau Carey Palm Oil Mill *et al.* in Malaysia, 25 Aug. 2010 – 4 Sept. 2010

Key words: Palm Oil Mill Effluent, Greenhouse gas, Energy, Environment, Communication

(1) Contents and activities during the overseas field training

"The Waste and Energy Management in Malaysia Industry" was coordinated by Associate Professor Shin Taniguchi from TUAT and carried out at Malaysia Palm Oil Board (MPOB), Nam Bee Palm Oil Mill (NB POM), Kuala Sawah Sewage Treatment Plant (KSSTP), Ebara Environmental Engineering Malaysia (EEEM), SIRIM Berhad (SIRIM), Plau Carey Palm Oil Mill (PC POM) in Malaysia from 25th Aug. to 4th Sep. The training was mainly consisted of plant visiting, discussions with the engineers and researchers and reporting of the each plant visiting. And some important information was obtained by the communications during meals with the engineers and researchers. In this report, I focused on the organic waste management in Malaysia and mentioned mainly about PC POM.

In Malaysia, the production of palm oil is an important industry, and Malaysia is one of the major producers of the palm oil. The factory for production of the palm oil (Fig.1), called Palm Oil Mill (POM), emits solid waste called Empty Fresh Bunches (EFB) and liquid waste called Palm Oil Mill Effluent (POME) (Fig.2) during the process. In the POM, EFB is used as a renewable energy by combustion. On the other hand, POME contains high concentration of organic matter and fats and is treated by anaerobic pond by ordinary (Fig.3), after that, treated POME is used as a fertilizer in the palm plantation. In this method, the emission of the green house gas such as carbon dioxide (CO_2) and methane (CH_4) from the pond is concerned. In addition, especially CH_4 has 23 times stronger green house effect than CO_2 (IPCC, 2001).

Fig.1 Palm oil mill (NB POM)

Fig.2 Palm oil mill effluent (NB POM)

Fig.3 Anaerobic pond (NB POM)

In order to reduce the greenhouse gas emission and energy recovery, POME treatment with energy recovery is addressing by the SIRIM and Tohoku University in the PC POM a one of the palm oil mills in Malaysia. They have suggested Reversible Anaerobic Baffled Reactor (RABR). The RABR process is novel high-speed methane fermentation system. There are two features in this process. First is applicable with higher organic loading rate than anaerobic pond. Second is energy recovery by CH_4 produced in the process because the process proceeds under the closed condition. Therefore, the recovered CH_4 can be used as an energy source for POM.

In this training, I aimed to elucidate environmental and energy issues in POM in Malaysia through plant visiting and several communications with the engineers and researchers.

(2) Findings and achievements obtained, significant experiences and lessons

Energy and environmental issues in PC POM

In the PC POM, EFB and CH_4 were produced as during palm oil process. EFB could produce enough energy for the POM. Therefore, the CH_4 gas produced in the RABR is excess and now CH_4 is combusted in the boiler, this is good method for environment because CH_4 is converted to CO_2. They can also sell the electricity from the CH_4. However, if they do that, the many grids are needed and it means high cost. Therefore, they are now considering CH_4 will be an energy source for the trucks in the plantation proposed by Mr.Azhar in the SIRIM.

The effluent from the RABR process is used as a fertilizer in the plantation. In the effluent, about 100 mg-NH_4/L is contained and NH_4 is a precursor of the Nitrous Oxide (N_2O) a green house gas with 296 times stronger green house effect than CO_2 (IPCC, 2001). However, N_2O have been not measured in their plantation. If large N_2O is emitted, this is an offset of the reduction of CH_4. However, usually the POME is also used as a fertilizer after the anaerobic pond treatment. Therefore, the research is needed for whether green house gas emission is increased or not through the whole process.

Communication with researcher

Except for long staying, the information obtained from the field may be thought to be limited due to

shortage of the observation. Therefore, the information obtained from the communication is also important. However, good communications to obtain the essentials about the field are difficult. In this training, I experienced such rare communication in accident in SIRIM as follow.

Mr.Azhar explained us how to measure the bio gas emission rate from the POME storage and gas emission rate from the natural site in east Timor. The former site was easy due to high emission rate and latter was difficult due to lower emission rate than the former by the same sampling method. After that he asked me how to collect the gas from the rice field because I introduced my experiment at first introduction to him and he remembered that thing. Then, I told him my method, which is common practice in my research field. Finally, the method was considered to be better for him to collect the gas from the natural site.

In this story, if I did not introduce my experiment to him, he could not know the other method for gas sampling during his explanation for me. This means the communication made beneficial (win-win) relationship for each other. Under the relationship, the communication could be sustainable and lead to the valuable information. Therefore, win-win relationship is important for good communication. This time, I had an opportunity to make a win-win relationship primitively.

From this training, I could learn about not only environmental issue in palm oil industry but also way of communication mentioned above. For me, the way of communication is new experience and I think they will be useful for my study. Fortunately, I will have many chances to practice it in my doctor study because my experiment is mainly conducted in a field in other institute and I can talk with many researchers in there. In addition, in my laboratory each member is addressing quite different experiment. Therefore, I would like to gain new knowledge from them through the discussions by using the communication.

Suggestion for the oversea training

I suggest lectures for FOENS related to the field training. I think this helps FOLENS students understand the overseas fields. Fortunately I experienced a field related to a lecture. And that was “Water/Wastewater Engineering” for FOLENS. This helped me understand the sewage treatment plant theoretically.

(3) Achievements and its future vision

In this training, I did not do the experiment. However, I could found the importance of the communication on the field work to gain the information of the field. On the other hand, the leader is top of the group and must know overall situation on the filed. Therefore, I thought the field-oriented leader in environmental sectors must have the communication skill to gain the valuable information.

The researchers in Malaysia had an idea of CH_4 usage as energy in the palm plantation due to transport energy and cost for the grid. In this manner, systematic thinking is also important in the field work. Environmental problems are related to other things and influence with each other. Therefore, I thought the field-oriented leader must consider the environmental problem systematically.

In the future, agriculture will become to be more and more important for food production due to population increase in the world. I would like to study about the greenhouse gas emissions from the

agricultural systems. However, famously agriculture has caused several environmental problems such as water pollution or air pollution by several kind of agricultural management. And such environmental problems in agriculture should be considered systematically. Therefore, I would like to contribute to environmental problems through the systematic research.

(4) Acknowledgement

This training was supported by the Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa.

And we thank Dr. Sivasothy Kandiah in Malaysia Palm Oil Board, Andy K. M. Chau in Pro-Info Sys Technology SDN BHD, Rijian plant manager in Nam Bee Palm Oil Mill, Lam Kok Chee and TanTech Siong in the Kuala Sawah Sewage Treatment Plant, Katsuhiko Matsui in Ebara Environmental Engineering Malaysia SDN. BHD., Azhar Abdul Raof in SIRIM Berhad, Hiromichi Hayakawa in Kajima Corporation, Daisuke Tanikawa in Tohoku University for introduction of their facilities and discussions with us.

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(supervised by Shin Taniguchi)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

The recycle using of waste, energy and innovation in Malaysia plants

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2nd Grade of Doctoral Course, Department of Chemical Engineering
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Nam Bee Palm Oil Mill(NBPOM)et al., Kuala Lumpur, Malaysia from 26th, August to 4th, September

Key words: Waste, Innovation, Energy, Environment, Communication

(1) Contents and activities during the overseas field training

From 26th, August to 4th, September total 10 day's overseas training in Malaysia, it's a good opportunity to learn Malaysian green technologies and environmental protection measures. Through this very essential training, undoubtedly I could enhance my ability and quality as a future environmental leader in the Asian regions. During these periods, professor Taniguchi and Sagehashi had taken us to lots of companies and plants, including visiting and meeting, such as Nam Bee Palm Oil Mill (NBPOM), Kuala Sawah Sewage Treatment Plant, Ebara Environmental Engineering Malaysia (EEEM), SIRIM Berhad Company (SIRIM), Kajima Corporation and Plau Carey Palm Oil Mill (PCPOM). Through the visiting process, we three students are all try our best to focus on the environmental issues or problems, try to ask lots of questions on the interesting environmental points and communicate with engineering from the companies or plants. Also, during the visiting or meeting time, we had took lots of the notes, and after go back we should conclude all the materials from the companies or plants to write the visiting and meeting reports.

In this report, I will mainly talk about the recycle using of waste, energy and innovation in Malaysia plants. Human societies influence natural environments enormously and bad effects are now global problems. Waste treatment is one of them. Also, sources and energies obtained from the nature have to become as much as unharmful to environments, when they return to the nature after being used for production and consumption. To achieve this, it is important to make efforts for innovation of production equipment and waste treatment methods. And how to make the waste materials become useful recycle energy and use it for production are also very essential for developing. During this overseas field training, such as Palm Oil Mill have got lots of innovation technologies that used in the production. Not only enhance the production purity rate and make the waste materials into recycle use for producing energy and other things, but also protect the environment by exhaust no bad odors or effluent into the air or rivers.

(2) Findings and achievements obtained, significant experiences and lessons

Malaysia is located in the southeast of Asia, near the equator and experiences a tropical climate. Because of the high temperature and humid, there is very good place for planting palm oil trees. Lots of the palm oil trees were planted here; of course the production is well. As we know that, palm oil trees are very famous for its practice value, the palm oil can be put into lots of using, such as cosmetic, eating oil, cleaner and so on. So luckily, firstly we have the chance to visiting the palm oil mill in Melaka which is called NBPOM. The mainly process of treating palm oil mill is: firstly, it should be treated in the sterilization tank by steam for one hour and a half. Then, put it into the stripping machine, through the bruiser digestion break the Mesocarp, and move it to the pressing machine. The extracting crude palm oil from the former process should be stewing for some while in the temperature of 80-90ºC, which is used for separating of water, impurity and oil. Next, through filtering and drying we can get the crude palm oil (CPO). In addition, the palm nut which separated from the residual of the palm oil can be through drying and nut cracking, we can get some nut kernel. Then, grinding it again and after pressing it can be become palm kernel oil (PKO) and palm kernel (Mohd Basri Wahid, 2010). During the processing, clarification operation is an important processing step that should be carefully handled with as much care as possible. As this is where the oil quality and part of the oil losses come into play, an in-depth knowledge of the clarification operation would be beneficial to the mill engineers.

Through the visiting, I have also recognized lots of innovation in Palm Oil Mill than before. Firstly, I should mention the continuous sterilization system. In this new process, the stripping of the fruits from the bunch stalks is significantly better than with the conventional sterilization process. Mills using this can be operated at close to steady-state conditions, making it unnecessary to make frequent adjustments to compensate for the types of process fluctuations encountered in a conventional mill. This not only makes significant manpower reduction possible, but also facilitates automation and minimizes the loss of oil and kernels. Secondly is Palm Oil Mill effluent treatment. In order to minimize the BOD levels of effluents, more advanced treatment technology is required and the activated sludge and biogas pilot plants are located. Thirdly, biomass used as an energy source through gasification can reduce greenhouse gas emissions. During this process, empty fruit bunches which is waste materials in the past time now can be used as a feedstock for gasification. Also, the conversion of empty fruit bunches to gaseous fuel provides opportunities for retrofitting the existing biomass boiler and displacing natural gas in process heating and power generation.

We also have visited the sewage treatment plant. Through the visiting, we know the sewage treatment processing much better. Besides this, we meet with the engineer Mr. Azhar of SIRIM Berhad about the Palm Oil Mill Effluent issues and manager of Kajima Corporation. From the meeting, we know that SIRIM Berhad Company also have do lots of research on renewable energy, set up some Malaysia's environmental standard, supple a series training about environmental analysis and control. And the Kajima Corporation is an environmental business company which provides cradle-to-grave environmental services that includes consulting, planning, design, construction and aftercare. In details, there are biomass energy recycling system Metakles, renewable energy engineering, environmental remediation, preservation and creation of the environment, protection and enhancement of the water environment and effective treatment and reuse of

waste.

(3) Achievements and its future vision

In order to become the environmental issue leader in the future, this overseas practical is a good opportunity for me to abroad my experience, enhance my environmental knowledge and skills, improve my communicating and exchange information abilities by English, and the most important point in my opinion is I have got the ability of recognizing what is an environmental issue, how to focus on that issue and of course how to think about the treatment methods or tackle methods based on that issue.

Besides this, during the meeting with managing director and engineering of Kajiama Corporation I also got lots of important useful information and ideas from them. Kajima Corporation provides lots of environmental services that including many fields, such as environmental remediation, renewable energy engineering and other 4 aspects. Because my research is about the dioxin polluted soil remediation by indirect heating methods, I have specified interested on the environmental remediation. Kajima Corporation has lots of innovation methods for treating the polluted soil, such as bioremediation for oil contamination, “drum soil” method for petroleum contamination, “micro-bubble entrainment” method for heavy oil product contamination. According to the different polluted compounds, they have lots of kinds of treatment methods, which have very good treatment effective and may not produce any other polluted. Also, they have environmental protection measures to prevent dioxin exposure. In details, work areas are tightly sealed and contained by fireproof sheets, and the air inside is removed by fans. This causes negative pressure inside the fireproof sheet work area, which prevents escape of air that may be contaminated by dioxins. And they also use ultra-high pressure water for blasting and cutting of refractory bricks and other structures of the incinerator, release of dust and vaporization of dioxins are prevented.

In a word, this overseas field training provides me with a chance to conduct field surveys in Malaysia to acquire the field-oriented mind and skill sets that are essential for competent environmental leaders in future.

(4) Acknowledgement

This training was supported by the Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa.

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Photo 1. Visiting in sewage treatment plant, Kuala Sawah, Malaysia. (30th August, 2010)

Photo 2. Meeting in SIRIM Berhad Company, Shah Alam, Malaysia. (1st September, 2010)

Photo 3. In Kajima Corporation, Kuala Lumpur, Malaysia. (1st September, 2010)

(Supervised by Shin Taniguchi)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

A Report of Green Technology Over Seas Practice 2010 in Malaysia

Shaofeng Gong
Doctor 1, Department of Applied Chemistry, Graduate School of Engineering
Destination and period：MPOB et al, Kuala Lumpur, Malaysia, 25/08/2010-03/09/2010

Key words: sewage treatment, POME, Malaysia, environmental, water resource

1. Contents and activities during the overseas field training

With the development of economy, science and technology provide great benefits to the society, but also bring many environment problems and must be managed in a responsible way to minimize any adverse effect on human beings and environment. Especially excessive pursuing economy and ignoring the environment treatment in some developing countries bring huge pollution problems. Malaysia is one of the developing countries with fast developing speed, the high increased economy also bring many environmental problems. So the FOLENS of TUAT organized the Green Technology over Seas Practice in Malaysia whose objective is to visit some local institutes, palm oil mills and sewage treatment plants to investigate the local environmental status and make clear the big problems about environment and at last proposed our corresponding solutions. Table 1 is the whole schedule of the practice.

2. Findings and achievements obtained, significant experiences and lessons

Water resource problem is one of the biggest environment problems and should be paid enough attention to. Palm oil industry and sewage treatment industry are two essential fields that affect the fresh water resource in Malaysia.

2.1 Modifying the palm oil mill process to decrease the effluent

The treatment of POME needs sophisticated processing, expensive technology, high power consumption and huge operating cost and is difficult to implement for the scale of operation of most mill is too small. Although develop new cheap and advanced POME treatment technology is very important, but

decreasing the yield of POME in palm oil industry is a more efficient and significant way. Thus, modifying the palm oil milling process to decrease the yield of POME is one of the best approaches to solve the current environmental problems brought by POME. To reduce the POME four following modifications of palm oil mill processes have been introduced to some mills.

Table 1 the schedule and actives of Green Technology over Seas Practice in Malaysia

date	visit place	Attendants	content
8/26	MPOB	S. Taniguchi, M. Sagehashi, S. F. Gong, S. Riya	The develop history of Malaysian palm oil industry and the application of new efficient technology in palm oil mill plants
8/28	Nam Bee POM	S. Taniguchi, M. Sagehashi, S. F. Gong, S. Riya, L. Zhao,	Visiting the whole process of Nam Bee palm oil mill and discussing with their engineers about environmental problems
8/30 (am)	Kuala Sawah STP	S. Taniguchi, M. Sagehashi, S. F. Gong, S. Riya, L. Zhao,	Visiting the whole process of sewage treatment plant and discussing with engineers of Kuala Sawah STP about environmental problems.
8/30 (pm)	EEEM	S. Taniguchi, M. Sagehashi, S. F. Gong, S. Riya, L. Zhao,	Discussing with engineers of EEEB about problems in design of STP
9/1 (am)	SIRIM	S. Taniguchi, M. Sagehashi, S. F. Gong, S. Riya, L. Zhao,	The development of green energy technology in Malaysia
9/1 (pm)	Kajima	S. Taniguchi, M. Sagehashi, S. F. Gong, S. Riya, L. Zhao,	Discussing with engineers of Kajima about problems in development and spread of environmental protection projects
9/2	Plau Carey POM	S. Taniguchi, M. Sagehashi, S. F. Gong, S. Riya, L. Zhao,	Visiting the treatment process of POME in Plau Carey POM

(1) Continuous sterilization process.

Sterilization is one of the key processes in the palm oil mill. The fresh fruit bunches are cooked using steam at a pressure of 3 bar for about 70 to 90 min. Compared with the batch sterilization, Continuous sterilization reduce the steam and labor requires.

(2) Zero dilution clarification process

Combining the continuous sterilization process with a new zero-dilution clarification process has verified to lead to approximately 50 percent reduction in the amount of effluent discharge from the mill.

(3) Evaporation technology

Evaporation technology can save 50% water and have higher heat transfer and little oil loss.

(4) Reduce the live steam usage in other processed

Compared with the traditional processes, these new improvements have decrease the volume of POME greatly and also brought some big benefits. In some process, using the modified processing can decrease more than 50% POME.

2.2 The main problems of sewage treatment

Sewage treatment is very important for protecting of our environment and save our depleted water resources and Kuala Sawah Swage Treatment Plant play an important role in protecting the local environment. Meanwhile, the following conclusion also can be gained from the case of Kuala Sawah Swage Treatment Plant:

(1) Sewage treatment plant needs huge investment but generate little, so government support s and public environment protection awareness play the key role.

(2)Local people's life style seriously affected the property of sewage, Designers should think about the affection brought the life style.

(3)Sludge treatment is also a very important link of sewage treatment, which is also the link can produce big profit (bio-gas). thus we should pay enough attention to it

(4)STP need huge emerge to run and the biggest energy exhaust link is aeration. More energy efficient technology is needed to developed

3. Achievements and its future vision

To improve global health and sanitation and consequent reduce the spread of disease and protect our limited fresh water resource, efficient decreasing the wastewater generated by domestic and industries, and collecting and treating of sewage is urgent needed in developing country. From this point, for improving the environment and protect our rare water resource the following points deserve much more attention:

(1) Get more investment from local government and the developed counties.

(2) Develop low cost and high energy efficient technology

(3) Promote environmental protection awareness and formulate strict environmental protection regulation.

4. Acknowledgement

First and foremost, I would like to thank to FOLENS of TUAT, who organized and funded this overseas practice. Besides, I would like to thank to Prof. Shin Taniguchi and Prof. Masaki Sagehashi for the valuable guidance and advice. They inspired us greatly to work in this practice. Their willingness to motivate us contributed tremendously to our practice. Finally, an honorable mention goes to these Malaysian plants and friends for their understandings and supports on us in completing this practice.

Photos

1 Visiting of Nam Bee Palm Oil Mill

2 Taking joint photo with Doctor Sivasothy Kandiah of MPOB

3. Visiting the Kuala Sawah STP

4 Discussing with engineers of EEEM

(Supervised by Shin Taniguchi)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Evaluation of sediment and carbon losses associated with soil surface erosion

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M1 - International Environmental of Agriculture Science, Tokyo University of Agriculture and Technology
Destination and period: Vietnam Forestry University, 08/25 – 09/25/2010

Key words: Soil erosion, land use, Carbon loss

(1) Contents and activities during the overseas field training:

Overseas field training is a core activity in the FOLENS program. On September, I had a field trip to Vietnam Forestry University, Vietnam, under the guidance of Professor Takashi Gomi and Dr. Phung Van Khoa (The lecturer of Vietnam Forestry University) with title: "**Evaluation of sediment and carbon losses associated with soil surface erosion"**. In this overseas field training, my main objective was to examine potential soil erosion and soil production (C, N) in different land use types of low mountainous region of northern Vietnam; then evaluation the relationship between processes of soil loss and maintenance of soil product ivies. We finally address the land management practices and soil conservation in agriculture and forested land.

Soil erosion and production has been one of the leading environmental problems not only in Vietnam but also in the world. Each year, about 10 million ha of cropland are lost due to soil erosion, thus reducing the cropland available for food production. This is a serious problem because more than 99% of the world's food comes from the land. On the other hand, soil erosion is a natural and inevitable process that can become serious environmental and economic problem when it is accelerated by human activities. Water supply and storage reservoirs, freshwater and coastal environments, agriculture and urban productivity can all be negatively impacted by accelerated soil erosion. Among the factors explaining the intensity of soil erosion, plant cover and land uses are considered the most important, exceeding the influence of rainfall intensity and slope gradient (Thornes, 1990). Without exception, deforestation and substitution of forest by human activities has led to a

dramatic increase in soil erosion. That we have provided useful information aiding understanding of the relationships between changes in plant cover and soil erosion is very essential.

This study was carried out at Luot mountain and adjacent area of Vietnam Forestry University, located in Xuanmai town, Chuong My district, the northwest of Ha Noi capital. Based on LANDSAT data and remote

sensing supervised classification, we selected 10 land use types, which are typical in the low mountainous region of northern Vietnam (Paddy field and wetland was excluded for this study). For each land use types, we selected three small plots (1 x $1m^2$), thus, we totally collected 30 small plots. On each small plot, we measured coordinate, slope, vegetation, litter, soil hardness, soil texture, soil moisture, evidence and feature of soil erosion. In addition, we collected soil samples to analyze soil water repellency, soil C/N ration, soil organic content. Since litter and ground cover condition may be associated with solar radiation input (light condition) to ground surface, we measured canopy openness using a fisheye lens and digital camera.

These are some pictures of this field trip.

Fig.1, 2 Overview of this study site

Fig. 3 Collected understory vegetation and litter

Fig.4 Collected soil sample

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

Overseas field training is one of the significant activities in the FOLENS program. In my opinion, I confirmed that it was a really positive experience for the participants. We were asked which aspects of the field trip increased their interest and/or understanding of environmental section. Students rated “seeing what environmentalists do” as most important. We were also asked to rate their understanding of various aspects of environment before and after the field trip to see where they developed the most as a result of the field trip. As a result of our participation, our awareness of the diverse students and professionals interested in environment increased the most.

On the other hand, overseas field training provides students with opportunities for seeing and learning real development issues confronting many developing countries of today. It also acquires an interdisciplinary perspective through group work with students from different academic disciplines; nurture their insights and skills for coordinating among stakeholders with conflicting interests through a case study of a small area. Moreover, we can improve our communication skills through group work with people from diverse cultural and professional background and conducted field survey in English.

For myself, I got many actual experiences from this trip. I knew and understood clearly on the local environment and observation condition in Vietnam Forestry University. We also had a good opportunity to learn how to and what to do in the Field investigation and in the lab. I met and worked with people who are interested in the same things as me and to find out what they want (and did) with their research and their view on the different methods. I received their support about work and passions and all the different experiences that are available. It’s hard to point to one thing that was the most inspiring, because the whole trip was full of so much information. We would like to express our sincere gratitude to Dr. Phung Van Khoa, who were extremely personable and offered advice that I will keep for future study decisions. In Vietnam, I had gained many experiences with short time, only a month.

(3) Achievements and its future vision (less than 400 words)

After I come back to Vietnam, I will continue to work at Vietnam Forestry University as a leader of environmental science and resources management. Skills and knowledge (comprehensive perspectives based on field experience and ability to develop environmental management strategies) that I gained from this program which can contribute significantly to my future teaching work. Like any Vietnamese, all qualities I possess are normal, those are enthusiasm and idealism about a clean sustainable world, a fair – equal society, where people all over the world have the same right to live whit pure air, the right to use an abundant clean water resource, and the right to share technology in efficient waste disposal. So that, I hope I can impart to students not only knowledge, but also my thoughts, and a willingness to contribute as much as possible for developing a sustainable world. I will teach my students, as they will have more opportunities to approach new information and technique for environmental monitoring and assessment. I specifically focused on forest and watershed management for teaching students when I go back to my country. Watershed framework is important and essential for the environmental leaders who will serve efficiently and directly for our future living

environment and natural resources management.

I also would like to continue utilizing network and friendship with other international students which gained within this program and IEAS. This network will also be important for future generations, and contribute to the world's enterprise of preserving our planet, in which, Vietnam is an indispensable part.

(4) Acknowledgement

I would like to express our sincere gratitude to Prof. Gomi and Dr. Khoa for their great support and hospitality while we were in Vietnam. I appreciate support by field and laboratory assistances in Vietnam Forestry University. I also sincerely thank supports by FOLENS staffs (Profs. Furuichi, Ninomiya, and Ozaki) who gave me the good opportunity to go to this Overseas field training.

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(Supervisor: Prof. Takashi Gomi)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Study on the Rice Breeding and Production System and Environment Condition in Mekong Delta, Vietnam

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Master, International Environmental and Agricultural Science
Graduate School of Agriculture

Key words: bio-organic fertilizer, agro-chemical, sustainable agriculture

(1) Introduction (Contents and activities during the overseas field training)

Mekong delta, located on the Southern part of Vietnam, is consisted of about 20 percent of total Vietnam population. With about 63.1 percent of land used for agriculture, Mekong delta is a potential area for agriculture field, contributing about 20percent of the total Vietnam's GDP. So far, farmers have extensively used agro-chemical and even more greater amount in response to the climate change in their agro-production systems, especially paddy rice field, to ensure the fruitful output. Consequently, the residue of agro-chemical is a non-point source pollution, which has recently become a big threat to the environment in Mekong delta. Moreover, the increasing price of agro-chemical has led to the reduction of farmers' income, which is a stumbling block to the government's poverty reduction poverty. Simultaneously, with the increase in population, the demand for energy has been increasing at a quick pace rate with the average rate of about 14.7 percent per year while the access to electricity and energy is still limited, especially for the rural area, which has led to the scarcity of energy support for the population (Nguyen Le Troung, 2004). To fulfill the shortage, fossil fuel and especially energy wood have been used. However, the use of fossil fuel and wood is not so stable due to the increase in price, degradation of forest and environmental problems. The overuse of agro-chemicals and energy shortage challenge have been a thorny issue for Mekong delta.

The purpose of this report is to illustrate the activities and the achievements of oversea field training which has been conducted in Mekong delta, Vietnam. The field training was conducted under the topic "study on the rice breeding and production system and environment condition in Mekong delta, Vietnam", with the main focuses on farmers' rice cultivation traditional and changing practices, and other challenges related to environment for famers in Mekong delta. Lasting for two week from 17 September 2010 to 30 September 2010, the field training was successfully conducted under the guidance of Professor Dr. Hirata Yutaka and in cooperation with laboratory of Plant breeding of Can Tho University, Vietnam and especially

under financial support by FOLENS (Education Program for Field Oriented-Leaders in Environmental Sectors in Asia and Africa).

Figure 1: Biotic and abiotic problems in paddy rice field

During the field training, some provinces in Mekong delta area were selected as visiting sites. Ang Giang and Soc Trang provinces were selected for rice cultivation field visiting in order to investigate the farmers' traditional cultivation practice and the change in their practice. Apart from this, there was also site visiting to Anh Long province and some areas along Mekong River to observe the use of biomass in farmers' scale. Moreover, information inquiry and some field experiment visit were also conducted in Can Tho University with the help of staff in laboratory of plant breeding.

(2) Findings and achievements obtained, significant experiences and lessons

The excessive use of Chemicals in agriculture especially paddy rice field has been identified as the main cause of the soil degradation and water pollution in Mekong delta. Faced with The adverse change of climate, salinity and acid soil problems and pests, farmers has used even greater amount of fertilizer and pesticide to ensure that they can enjoy the fruit of their agro-products. However, this kind of practice has resulted in farmer's loss in income and even caused even more serious impact on the environment. That proves that intensive agro-chemical usage in agriculture in Mekong delta is not suitable and compatible with the farmers and environmental condition any more, which necessitates a suitable and long-term solution.

Besides, the energy shortage challenge has been considered as a main problem for Mekong delta, especially rural area. Nguyen-Thien, Thanh reported in *Biomass Utilization Development in Vietnam* report that in Mekong delta, 70 percent of the population is living in rural area. However, only 80 percent of them has access to electricity and energy provided by the government, while the rest are depending on wood and fossil fuel to get energy for their daily lives.

To deal with above stated problems, an idea of sustainable agriculture has been put under consideration and introduced to farmers. With the use of new improved varieties which are resistant to disease and pest, farmers have reduced the use of pesticide in their paddy rice field. What's more, the bio-fertilizer and organic fertilizer have been introduced to farmers. The bio-fertilizer and organic fertilizer not only help farmers reduce their expenditure on chemical fertilizer but also improve the soil quality and reduce the environment pollution compared to the chemical ones.

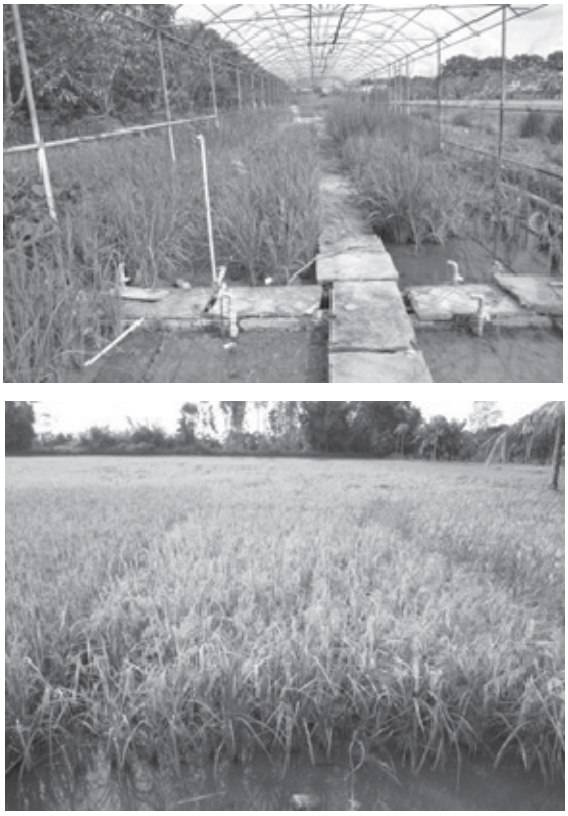

Figure2: Rice Varieties Improvement testing

Moreover, the introduction of biomass and biogas production in small scale has helped not only meeting population's demand for energy but also famers making a better and efficient use of residue agro by-production such as straw, cow dung, sugar cane etc. efficient use of these materials is considered as reduction of CO_2 emission which contributes to the world's action against the global warming.

Figure3: Process of Biomass small scale Use in An Long Province

From the observation from during the field training, the concept of sustainable agriculture and renewable energy could be successfully applied in developing countries to ensure the food security, sufficient energy usage and a clean environment, which lays the cornerstone for the socio-economic development and poverty reduction.

(3) Achievements and its future vision

With the world struggling with increase in population and climate change, demand for more food and sustainable source of energy are becoming a big concern among human races all across the world.

Excessive amount of fertilizer and agro-chemical such as insecticide, applied in agriculture sphere to ensure the crop productivity, has caused the adverse changes to the environment. Moreover, the increase in price of agro-chemical makes it no longer compatible and friendly to farmers due to their loss of income.

In addition, the Mekong delta's population especially in rural area has faced the shortage of energy supply for their daily lives, which result in the heavy depend on wood fuel and fossil fuel. However, interestingly, there is an inefficient use of abundant resources from the agro-residues has led to environment contamination and loss of resource for energy.

However, the improvement in agriculture practice system with resistant varieties as well as bio-organic fertilizer and usage of biomass seems to have worked in Mekong delta, with the reduction of environmental impact of agriculture activities and farmers' expenditure on agro-chemical.

Therefore, the idea of sustainable agriculture and renewable energy usage can be considered a more potential and realistic strategy to achieve the food security and material-cycle societies for our current and future generations which are struggling with the climate change and food and energy crisis. Moreover, that might lead to the poverty reduction which causes the environment problem from the viewpoint of vicious poverty and environment cycle.

However, personally, the successful implementation of these concepts is not easily achieved. Based on my experience in the field training, the international cooperation, local networks and participation of local people are necessary and should be considered top on priority.

(4) Acknowledgement

I would like to express my deep gratitude towards Professor Dr. Hirata Yutaka for his useful guidance and support during my oversea field training. I wish to show my great thanks to Dr. Vo Con Thanh and other colleague of Plant Breeding laboratory of Can Tho University for their kind support during stay in Vietnam for overseas field training. Finally, I would like to express my deep gratitude and high appreciation for FOLENS program and FOLENS staffs for facilitating and providing me great opportunity for this useful oversea field training. But for the FOLENS' financial support and staff's administrative facilitation, this field training would not have been successfully achieved.

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(Supervised by Prof. Hirata Yutaka)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Sources Identification of Sedimentary and Atmospheric PAHs in Jakarta, Indonesia

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Doctor Course, Symbiotic Science of Environmental and Natural Resources, United Graduated School of Agriculture
Destination and period: Jakarta, Indonesia, September 26th- October 12th, 2010

Key words: Polycyclic aromatic hydrocarbon (PAH), organic pollutant, environmental sampling, water pollution, garbage dumping site

(1) Content and activities during the overseas field training

In the morning of the first day, we visited the laboratory which was used for samples pretreatment, Lab of General Chemistry in State University of Jakarta. After we kept some equipment in the laboratory, we started to collect samples from some areas in Jakarta. We divided this training into two sessions, firstly we conducted some sampling activities with my supervisor, Prof Hideshige Takada, and secondly I conducted some sampling activities by myself.

A. First Activities (September 26th-October 2nd)

Sediment sampling: surface river sediment samples were collected using Ekman Dredge from several rivers that flow through Jakarta. There were 3 different areas, namely (1) northern of Jakarta, the area related to downstream river, (2) middle of Jakarta, the area with located in the middle of the city, (3) southern of Jakarta, the area related to upstream river. ***Water sampling***: water samples were collected using stainless bucket from river water where sediment sample was collected. Water samples also were collected from groundwater sources to investigate water quality in urban area. Several important parameters of water quality such as pH, temperature, conductivity, and salinity were measured directly in the sampling site. ***Garbage dumping site*****:** leachate samples were collected from Bantar gebang landfill. Parameters such as pH and conductivity of the leachate were measured directly. Fig 1 shows the first sampling activities.

Almost all of the sampling location mainly innorthern of Jakarta where we collected river sediment and water samples were polluted rivers with characteristic dirty water, black color, a lot of floating garbage and odor. The smell from garbage and waste was really strong. Jakarta has only one sewage treatment plant

which means limited area was covered. Most residents discharge their domestic waste directly to the river or canal. The low social awareness in taking care of their environment can be seen by the huge amount of garbage that they discard to the river or canal. Throwing household garbage into the Ciliwung river as the main river flowing through Jakarta city has been a routine for residents in Jakarta for many years. That is why Ciliwung can be the longest garbage river in the world. Many industries also discharge directly their effluent to the river or canal making worse condition.

(a)

(b)

(c)

(d)

Fig. 1 (a) water sampling, (b) polluted river, (c) sediment sampling, (d) garbage dumping site

Several rivers where near to the industrial area look more polluted. The pollutant not only come from common garbage but also caused by oil disposal activity. In one location sampling, we found small industry handling used engine oil from boat without waste treatment and discharge their waste directly to the river. The polluted rivers have become serious environmental problem in Jakarta. There are 13 rivers running through Jakarta city and enter into Jakarta Bay. This makes Jakarta Bay has function as receptor of domestic waste, industrial effluents, urban runoff, port activities and spillage may cause heavy pollution in this area. Some researchers (Arifin, 2001, Rohyatun, 2008) have revealed heavy metal pollution in this area. However, there is still limited data for micro organic pollutant. The sediment river sample collected will be analyzed to identify and quantify polycyclic aromatic hydrocarbon (PAH). PAHs have become increasingly concerned due to their toxicities and persistence including mutagenic, carcinogenic, and endocrine disrupting nature.

Bantar gebang is the biggest landfill in Indonesia which an area of more than 100 Ha. It looks like as mountain of trash. In Indonesia including Jakarta, it is common that household does not separate their garbage to several group such as combustible, incombustible, recycle material etc, so in nearby this landfill we can find communities who are living as collector and separator garbage. They live in extreme poverty and use the landfills as a source of food and income. A large number adverse impact may occur related to landfill operation.

Most of rivers in Japan are by far much cleaner than those in Jakarta. This is because Japan has sewage treatment plant system and also Japanese have high awareness to take care their environment. They don't discard their garbage directly to the river or canal. They are accustomed how to classify their garbage before throw away.

Public lecture: Prof Takada gave talk about International Pellet Watch in University of Lampung as one of the host universities. Because the university is not located so far from the beach, the topic selected by Prof. Takada become more interesting and have got good respond.

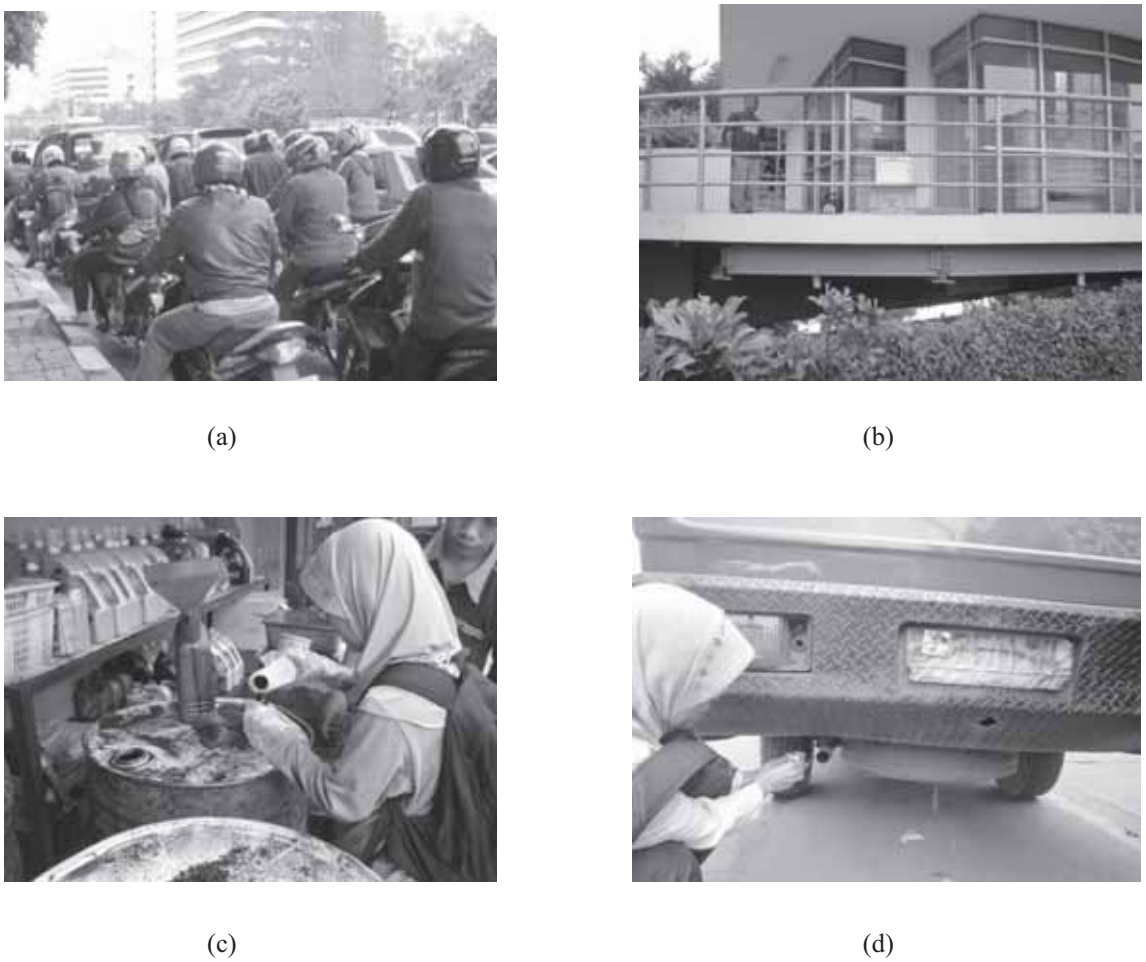
B. Second Activities (October 4th-October 8th)

Air sampler: air samples were collected using High Volume Air Sampler (HVAS) from 5 locations where 3 locations for representative of heavily traffic road, 1 location for representative of industrial area, and 1 location for representative of residential area. Prof Takada demonstrated how to install HVAS in one location of heavily traffic road. The remaining locations of heavily traffic road, industrial area, and residential area were done in the second activities. ***Street dust***: street dust samples were collected from several locations using brush and shovel and kept it in the screw can. Street dust samples were collected from heavy traffic road, 3 samples from industrial area and 3 samples from residential area. ***Engine oil*** : fresh engine oil and used engine oil samples were collected from fresh engine oil store and service station whose store temporary storage for used oil. ***Soot*** : soot samples were collected from the gasoline and diesel vehicles by scrapping the inner wall of exhaust pipe with a spatula. Totally sixteen soot samples were collected from 3 truck soot, 2 bus soot, 3 diesel minivan soot, 3 gasoline car soot, and 5 motorbike soot. ***Tire*** : used tire samples were collected from tire stores which keep used tire for temporary and street vendor who sells used tire. Totally 5 samples tire used were collected by cutting small pieces of tire using knife. The second sampling activities are shown in Fig. 2

Jakarta is the capital city of Indonesia which is center of politics, economy and social activities. It has an area 661 square kilometer and 9.5 million inhabitant based on the latest census count population (Setiawati, 2010). Currently, the motor vehicle is increasing by about 1.3% per year (Central Bureau of Statistical Jakarta, 2002). However, the road expanding is limited and not sufficient to meet the increasing vehicle. Current public transportation in Jakarta consists of various type of car, starting from mini van (angkutan kota), to slightly larger bus (metro mini), and full sized city bus (bus kota). There are also both two (motorbike) and three (bajaj) wheeled taxis. Due to the poor public service transportation people still prefer to use their private car facilitating their transport. And there is no massive public transport in city. This fact implies Jakarta traffic congestion in main road of Jakarta especially in morning and late afternoon. We suffer traffic congestion every day during our sampling activities. The limited area has caused Jakarta

resident spread out in last decade to other surrounding area Jakarta. Now Jakarta and the surrounding area namely Bogor, Depok, Tangerang, Bekasi have been growing as metropolitan area, Jabodetabek. The urban structure is changing rapidly and dynamically but the urban transport system serving Jakarta and the surrounding area change slowly. As a consequence traffic congestion becomes worse and crowded. In the early 1990, UNEP ranked Jakarta as the third most polluted megacity in the world after Mexico and Bangkok (World Bank 2003). In Jakarta, automobiles are regarded as the main sources of air pollution. The main pollutant such as Pb, NO_x, SO_x, particulate matter, CO, CO_2 and HC have been revealed. However, the data for PAH is still limited. These sampling activities were done to get samples related to the traffic or automobiles in Jakarta for PAH sources.

Unlike with Jakarta, Tokyo does not suffer traffic congestion such as Jakarta. Tokyo has good massive transportation and policy to encourage people use the public transportation than private car. They also have good habit, riding bicycle to go somewhere when the place not so far.



(a) (b)

(c) (d)

Fig. 2 (a) traffic congestion, (b) aerosol sampling, (c) used engine oil sampling, (d) soot sampling from minivan

(2) Finding and achievements obtained, significant experiences and lessons

Overseas Field Training gave me the opportunity to learn how to handle environmental sample collection practically, from planning and preparing, during traveling, sample collection and preserving. Although I focus to collect sediment and aerosol sample, but handle other samples is very important to improve my skill and knowledge. For my doctor course I will analyze PAH from sediment, aerosol and potential source materials related to the traffic. This research will study distribution, source identification and pollution level. The results will be important to the government and stakeholder to reduce pollution by pollutant controlling from source point.

Overseas Field Training not only gave me the opportunity to handle environmental sample collection but also chance to meet local people. Their life style and condition must be affected to the environment. The environmental problem such as pollution in air, water, coastal, soil, increasing sea level, flood etc can be observed directly. If there is no serious action taken, this problem will become extremely bad conditions for the future.

My background is related to sample analysis, working in laboratory to solve environmental problem. But to be field-oriented leader in environmental sector it's not enough. In this side, Overseas Field Training will become an exercise to improve social sense with observation of the real environment, get information and perspective from local people, their life style and some other real problems. For the future it will be valuable experience and lesson to make right decision solving environmental problem as a field oriented leader.

(3) Achievements and its future vision (less than 400 words)

The Overseas Field Training gave valuable experience and lesson to my future. I observed so many environmental problems in society. Sometimes we already know the technology and solution to solve the problem, sometimes we already know heavy polluted area, but without willpower, leadership, manpower, and coordination, solving environmental problem never gain success completely. Indonesia government has launched several programs to solve environmental problem, but the result is still not optimum. Environmental problem cannot be solved by one person or one discipline. It is needed good planning, execution and control. We need integrated and comprehensive approach to solve the problem. We need to work together from government to common people, from local to regional and international, and from researcher to stake holders. So to my future, I will develop collaborative research to contribute solving environmental problem more comprehensive.

(4) Acknowledgement

The Overseas Field Training was financially supported by FOLENS Program. The author thanks to Prof. Hideshige Takada as the supervisor who joined and gave guidance through this sampling, and also to FOLENS staffs for arranging this trip. The assistance from several graduates in fieldtrip is gratefully

acknowledged. Also thanks Dr Mursilah for providing laboratory and Dr Andi for arranging documents needed for sampling activities in Indonesia.

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(Supervised by Prof. Hideshige Takada)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

The investigation of treatment technology of soil pollution and efficiency usage technology of energy in China

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2nd Grade of Doctoral Course, Department of Chemical Engineering
Graduate School of Engineering
Chinese Research Academy of Environmental Science (CRAES) et al., Beijing, China from 27th, October to 5th, November, 2010

Key words: Soli Pollution; Simulation; Safety Control; Energy Efficiency

(1) Contents and activities during the overseas field training

The overseas field training was carried out in China from 27th, October to 5th, November, 2010. It is a very good chance for me to investigate the treatment technology of soil pollution and efficiency usage technology of energy in China. This important training improved my personal ability and acknowledgement greatly for me as a future environmental leader in Asia and Africa. During this training time, my tutor (professor Taniguchi) and I visited a series of research institute and plant which included such as Chinese Research Academy of Environmental Science (CRAES), Beijing Municipal Research Institute of Environmental Protection, Research Institute of Petroleum Processing (RIPP), Chinese Academy of Sciences (CAS), Ebara Boshan Pumps Co., Ltd, Zibo Shandong China (EBP). During the visiting process, I tried my best to focus on the issues or problems of soil pollution, usage of energy and product, asked lots of questions and communicated, discussed with the researcher and engineer of the research institute or plant. At the same time, during the time of discussion or conference, I also took lots of notes, and after went to back hotel I summarized the notes and memories in a report every day.

The treatment technology of soil pollution, efficiency usage of energy and control of environment and safety in plant will be introduced in this report. The developing countries such as China are facing the serious conflict between environment and development. In fact, it is very urgent for these counties to control environmental pollution, improve the usage efficiency of energy, and control the safety and emission of the plant. During this overseas field training time, I knew that the research of soil pollution control are being carried out in Chinese Research

Academy of Environmental Science (CRAES), the research of efficiency usage of energy are being carried out in Chinese Academy of Sciences (CAS). In addition, the condition of safety control and environment control is very good in Ebara Boshan Pumps Co., Ltd, Zibo Shandong China (EBP). It is certain that the investigation can give us a clear framework of the present treatment technology of soil pollution and efficiency usage technology of energy in China.

(2) Findings and achievements obtained, significant experiences and lessons

China is the biggest country in Asia, which locates in the southeast of Asia. During the past thirty years, great changes happened in China. China made great progress in development of industry, especially in economic. Till now, its amount of GDP reaches the second position in the world. However, as the result of industrial development, many issues such as environmental pollution, exhaust usage of energy, control of environment and safety in plant appeared in China. Fortunately, China government realizes these issues and supplied method to deal with them. In this section, three parts will be introduced. We can have a comprehensive understanding of treatment technology of soil pollution and efficiency usage technology of energy in China.

Firstly, I visited the Department of Soil Pollution Control, Chinese Research Academy of Environmental Science (CRAES), and did series of experiments of how to check the effect of acid rain on soil. Doctor. Tian Wenjie showed me how to detect the PAHs in the polluted soil. The sample was first milled, and separated into different meshes. Then, the treated soil was dissolved into organic solution. At last, the extracted solution was analyzed using HPLC (high performance liquid chromotopragraph), thus, the Level of PAHS was detected, and the related treatment method will be suggested. Doctor Tian is doing the research of effect of acid rain on the PAHs contents in the polluted soil. It is a very interesting experiment, the routine of effect of acid rain on the PAHs contents in the polluted soil will be got by a series of simulated experiments. At last, a treatment method will be made for the polluted soil. I also discussed with Prof. Gu Qingbao and Prof. Hou Hong, they introduced the main research sections. They said a set of soil treatment technology was applied in a plant.

Secondly, I visited Sinopec Corp. Research Institute of Petroleum Processing (RIPP) and process engineering research lab, Chinese Academy of Sciences (CAS) respectively. After the discussion with Doctor Ma Chengguo anf Doctor Hou Ao, I learned the recent progress of desulphurization technology of crude oil and Gasification technology of coal. They all used simulation software to estimate the actual reaction data, and the data will be a reference for the industry. It is very helpful for the decreasing of polluted gas and the saving of energy. After the visits, I have a basic understanding of how to use the simulation software is very helpful for the experiments.

At last, I visited Ebara Boshan Pumps Co., Ltd, Zibo Shandong China (EBP). Firstly, Terada san introduced the general history of EBARA and EBP to us, which made me have a basic understanding of EBP. Secondly, Mrs. Zhang Yuqin introduced the environmental control of EBP

to us, after her introduction, we know that little of waste water gas was produced in EBP, and the level of noise is below the China standard. Thirdly, Mr. Wu Zhenping and Jiang Zuodong introduced the safety control and enrollment of new employee in EBP. Honestly speaking, the safety control in EBP were carried out very well, there are almost no accident in EBP. Yasunaga san showed us to visit the whole process of pump production, he told us lots of knowledge of pump production, after the visiting of plant, we had a discussion, Yasunaga san has his own saying "safety is first, quality is second, customer is the god". After the visiting of EBP, I understand the environmental control and safety control is very important in a plant.

(3) Achievements and its future vision

In order to become an excellent environmental issue leader in the future, the field overseas training experience is a good chance for me to abroad my personal view, enhance my personal knowledge and skills of environmental treatment, improve my personal ability of communication and exchange information with others, and the most important point in my view is that I have got the ability of recognizing what is an environmental issue, how to focus on that issue and of course how to think about the treatment methods or tackle methods based on that issue.

In addition, during the meeting with Prof Guo Qingbao and Prof Hou hong, I also got lots of important useful suggestions and ideas from them. They told me how to apply own acknowledgement into the research and daily life, and must have a right attitude to carry out own study and research. Then, I can make great progress in my own work. After discussed with my friends Dcotor Ma Chengguo and Hou ao, I learned that how to carried own work in a strange environment as a new employee. They told me that they obtained acknowledgement form university is not enough for their work at present, they need to study all the time in their working environment. I will never forget the visiting in Ebara Boshan Pumps Co., Ltd, Zibo Shandong China (EBP). Although it was only two days time, I still learned so many acknowledgements than my personal imagination. After the discussion with manger Terada and Yasunaga, Mrs. Zhang Yuqin, Mr. Wu Zhenping and Jiang Zuodong, I understood why EBP becomes a so successful international company in the world. EBP try its best to care employee, to pay its duty to the society, to protect our environment, to rich our daily life. I think it is the best to cited the saying of manager Yasunaga" afety is first, quality is second, customer is the god"

At last, this overseas field training provides me with a chance to conduct field surveys in China to acquire the field-oriented mind and skill sets that are essential for competent environmental leaders in future.

(4) Acknowledgement

This training was supported by the Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa.

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The investigation of treatment technology of soil pollution and efficiency usage technology of energy in China

Sen Li

Photo 1. Meeting and doing experiments in Chinese Research Academy of Environmental Science (CRAES). (29 th October, 2010)

Photo 2. Visiting Research Institute of Petroleum Processing (RIPP) and Chinese Academy of Sciences (CAS). (2 th November, 2010)

Photo 3. Visiting and meeting in Ebara Boshan Pumps Co., Ltd, Zibo Shandong China (EBP). (4th November, 2010)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Collection of Chrysanthemum sensu lato species in China as plant materials, for flavonoid analysis

Ayumi Uehara
2nd grade of Doctor Course, Department of Biological Production Science, United Graduate School of Agricultural Science
Destination and period: 12, Oct. – 18, Oct. 2010

Key words: Asteraceae, *Chrysanthemum* sensu lato, leaves, flavonoids, Beijing

(1) Contents and activities during the overseas field training

I and my supervisor, Prof. Dr. Tsukasa Iwashina are surveying the flavonoids in the leaves of *Chrysanthemum* sensu lato (Asteraceae). Flavonoids are the important resource, which are utilized as pigments and medicinal materials. The genus *Chrysanthemum* sensu lato is classified to the tribe Anthemideae of the family Asteraceae, I notice subtribe Artemisiinae in particular. This subtribe includes some important ornamental, edible and medicinal plants such as *C. morifolium* and *C. indicum*. Their species have already been surveyed about flavonoids (Bohm and Stuessy, 2001). However, other species in the subtribe have not been investigated. My purpose of the research is to survey flavonoids of *Chrysanthemum* species and find these chemical characters as unutilized resource. We have already isolated and identified the almost flavonoids in Japanese *Chrysanthemum* sensu stricto and now are in progress about Japanese *Chrysanthemum* sensu lato species. Moreover, I also hoped to survey the flavonoids of Chinese species. China is the biggest country in Asia and keeps many plant resources including *Chrysanthemum* sensu lato, because the country has various environment such as forests, grass land, rocky, desert, high mountain, seashore and so on. However, chemical characters, composition and distribution of the flavonoids are not well known in many Chinese plants. China has some problems such as environmental disruption by rapid development, so some plants are in danger of extinction. I think that the Chinese plants are very important and their flavonoid composition should be clarified.

The plants produce flavonoids for the defense from various environment stresses, e.g. ultraviolet rays (UV), low temperature, dryness, and attack from insects. *Chrysanthemum* species grow in sunny places, which are exposed to stronger UV irradiation such as rocky place and seashore. Many Chinese *Chrysanthemum* species are adapted to various environments. I expect that their flavonoids are quantitatively

and/or qualitatively different in various environmental conditions.

My purpose of the research is to clarify the interspecific and intraspecific variation of flavonoids in Chinese *Chrysanthemum* sensu lato species in collaboration with Prof. Dr. Whang Liang-Sheng. He belongs to Beijing Botanical Garden, Institute of Botany, the Chinese Academy of Sciences, and is my counterpart. I collected the plant materials of "*Chrysanthemum* sensu lato" species to survey their flavonoids in this program.

This field trip includes the program for FOLENS, field-oriented leaders in environmental sectors in Asia and Africa. The leader needs to have some knowledge, which is concerned to environmental issues, local society systems, lifestyle of each area and so on. How can we get this knowledge? I think that many experiences and communications at various areas of the world are the key factors. I want to get some knowledge and experience for the leader through the lecture.

I and my professor stayed in Beijing and its suburb, China for 7 days. Our schedule was as follows. First day: Departure to China. Second day: Inspection of *Chrysanthemum* field for ornament at "North National Forest Plantlet Exemplary Base" with Prof. Wang and Prof. Dai. Prof. Dai is a researcher of ornamental *Chrysanthemum* and belongs to Beijing Forestry University. In this afternoon, we visited "Beijing Forestry University" and I lectured our research to some students and researchers. Third and forth days: Collection of *Chrysanthemum* sensu lato in Mt. Wulingshan, which is the highest mountain around Beijing area with Prof. Wang and Dr. Lin and Dr. Ri. Dr. Lin studies taxonomy of Asteraceae and helped our plant collection. Fifth day: Collection of the plant materials in Mentougou District with the same member. Sixth day: Visited Beijing Botanical Garden and Laboratory of Prof. Wang, and Seventh day: Return to Japan.

(2) Findings and achievements obtained, significant experiences and lessons

1. My research

We collected 4 species from 12 sites (sites name; A to L), i.e. *Chrysanthemum chanetii* from 3 sites (A, E and J), *C. lavandulifolium* var. *lavandulifolium* from 8 sites (B-D, G-I, K and L), *C. morifolium* and *Ajania parviflora* from D and L, respectively (Table 1 and 2, Fig. 1). *Ajania* species is also included in *Chrysanthemum* sensu stricto in Japan. Japanese *Chrysanthemum* sensu stricto can be divided in to three sections, sect. *Ajania*, sect. *Chrysanthemum* and sect. *Arcantherum* (Ohashi and Yonekura, 2004). Their morphological characters are as follows, i.e., sect. *Ajania* put tubular flowers alone on the head, but other sections have both tubular and ligulate flowers. These sections can be easily crossed and to make hybrids each other. I think that three sections are included in *Chrysanthemum* sensu stricto from this reason. On the other hand, another opinion is that their sections are independent genus, respectively. Collected species were identified by Dr. Lin, which advocates the former opinion.

Environmental situations of the 12 places where we collected the plants were as follows. A: mountain slope, B: mountain slope along the road, C: stone wall on terrace, D: mountain slope along the road, and on limestone or a small amount of soil, E and F: along the road in Mt. Wulingshan, G: mountain slope along the road, H and K: along the road near Zhaitang Reservoir, I: grasslands on mountain, J: mountain slope along

the road, and L: Beijing Botanical Garden. The collected plants have grown in locations with enough sunshine in every places.

Morphological characters of the species are as follows (Flora of China, 2010). *C. chanetii* put white, pink, or purple ligulate flowers and shape of the leaves is blade reniform, suborbicular, or broadly ovate. The leaves were sparsely pilose or glabrous. *C. lavandulifolium* put yellow ligulate flowers and shape of the leaves has widely varied, leaf blade ovate, broadly ovate, elliptic-ovate, long-elliptic, or ovate-lanceolate, and sparsely pubescent on both surfaces or glabrous adaxially. *C. lavandulifolium* is divided into 3 varieties, i.e., *C. lavandulifolium* var. *lavandulifolium*, var. *tomentellum* and var. *discoideum*. We collected the plants, which has sparsely pubescent on both surfaces. Their characters agreed with those of var. *lavandulifolium*. *C. morifolium* put yellow, white or pink ligulate flowers and shape of the leaves were blade ovate, lanceolate, or long-elliptic. These species are widely used as ornamental, medicinal and edible. The flowers of the collected plants are used as tea materials. *Ajania parviflora* put tubular flowers alone on the head and leaves are petiolate and blade ovate, the color is pale gray-white. The genus *Ajania* was reported in Beijing and adjacent area for the first time.

2. Training for field-oriented leader

On the second day, we inspected ornamental *Chrysanthemum* field, “North National Forest Plantlet Exemplary Base” with Prof. Wang and Prof. Dai. I talked with some students and Prof. Dai about breeding of *Chrysanthemum* cultivars. I could get some new knowledge about ornamental *Chrysanthemum* in China. And then, we visited “Beijing Forestry University” and lectured my research “Flavonoids in the Leaves of Japanese *Chrysanthemum* Species and Their Distribution Patterns” to students and their readers. It was my first experience that I perform the oral presentation and discussion in English.

On the 6th day, we visited Beijing Botanical Garden and Laboratory of Prof. Wang and I met and discussed with the students of Prof. Wang.

(3) Achievements and its future vision

1. My researches of “collected plant materials, *Chrysanthemum* sensu lato”

All the plants collected were put between newspapers for dryness. Plant materials were prepared for quantitative analysis (0.4 g dry weight /12 ml MeOH). Hydrophilic internal and high hydrophobic external flavonoids in the *Chrysanthemum* sensu lato species were analyzed with HPLC using gradient system. The measurement was performed with Shimadzu HPLC systems using L-column 2, ODS column (I.D. 6×150 mm, Chemicals Evaluation and Research Institute, Japan), at a flow-rate: 1.0 ml/min., injection: 10 μl, detection wavelength: 190-350 nm. The eluent was MeCN/H_2O/H_3PO_4 (22:78:0.2) for pump A and MeCN/H_2O/H_3PO_4 (40:60:0.2) for pump B. The gradient profile was 1.0 ml/min for 0~20 min and 1.0 – 0.2 ml/min for 20~30 min for pump A, 0 – 0.8 ml/min during 20~30 min for pump B, and finally 30~60 min 0.2 ml/min for pump A and 0.8 ml/min for pump B. The flavonoids of each Chinese *Chrysanthemum* species were compared with those of Japanese *Chrysanthemum* species. Moreover, the samples from 8 populations of *C. lavandulifolium* were surveyed for intraspecific variation of flavonoids of the population.

Interspecific variation of flavonoids among the species are now under investigation. On the other hand, intraspecific flavonoids variation of *Chrysanthemum lavandulifolium* showed the almost same pattern in all population. However, their flavonoids were quantitatively different in each altitude of the population. High altitude plants were caught in various environment stresses such as cold temperature and UV irradiation than those of lower altitude. Thus the plants may be synthesize flavonoids for defense from the environment stresses L population of *C. lavandulifolium* showed the different flavonoids pattern with other populations. The plant of this population has an additional hydrophobic flavonoid (retention time 25 min). This flavonoid was also found from *C. morifolium*. As a result, I think that the individual is a hybrid between *C. morifolium* and *C. lavandulifolim*. In the future, I will survey the flavonoids of *Chrysanthemum* and related genera in detail to completely identify their flavonoids and obtain much knowledge for unknown resources.

2. Training of field-oriented leader

This field trip gave me various experiences, e.g. communication with Chinese people, opinion about various environment in China, customs of Chinese, knowledge about *Chrysanthemum*, how to collect plants in the foreign country and so on. Chinese people are energetic and were very active. In the future, I want to be an active field-oriented leaders.

(4) Acknowledgement

Authors thank Prof. Whang Liang-Sheng and Dr. Lin Qinwen, Beijing Botanical Garden, Institute of Botany, the Chinese Academy of Sciences and members of the meeting with me for plant collection and good experience, and also, my sincere thanks to Prof. Dr. Tsukasa Iwashina, Laboratory of Plant Chemotaxonomy, United Graduate School of Agricultural Science, Tokyo University of Agriculture and Technology.

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(Supervised by Tsukasa Iwashina)

Table 1. Chrysanthemum species used as plant materials and their collection sites

Species	Collection sites
Chrysanthemum chanetii H.Lev.	A, E, J
Chrysanthemum lavandulifolium Makino	B-D, G-I, K, L
Chrysanthemum morifolium Ramat.	D
Ajania sp.	L

Table 2. Information of Collection site

Collction site	Altitude	Address	GPS-N	GPS-E
A	265 m	Taishitun-town, Miyun, China	40° 28' 5.64"	117° 2' 0.3"
B	231 m	Taishitun-town, Miyun, China	40° 35' 8.16"	117° 12' 35.12"
C	562 m	Caojialu-village, Miyun, China	40° 40' 37.69"	117° 26' 37.54"
D	536 m	Caojialu-village, Miyun, China	40° 39' 38.73"	117° 26' 38.73"
E	1367 m	Wulingshan Mountain, Miyun, China	40° 27' 44.68"	117° 27' 33.43"
F	1180 m	Wulingshan Mountain, Miyun, China	40° 36' 45.27"	117° 27' 52.67"
G	146 m	Mentougou District, Beijing, China	39° 59' 20.07"	116° 2' 7.94"
H	485 m	Zhaitang Reservoir, Mentougou District, Beijing, China	39° 50' 45.85"	115° 40' 29.74"
I	648 m	Zhangjiazhuang, Mentougou District, Beijing, China	39° 55' 35.49"	115° 31' 3.92"
J	1402 m	Xiao Long Men, Mentougou District, Beijing, China	39° 59' 19.14"	115° 25' 41.41"
K	482 m	Zhaitang Reservoir, Mentougou District, Beijing, China	39° 57' 33.06"	115° 39' 1.07"
L	76 m	Beijing Botanical Garden, IB-CAS, Xiangshan, Beijing, China	39° 48'	116° 28'

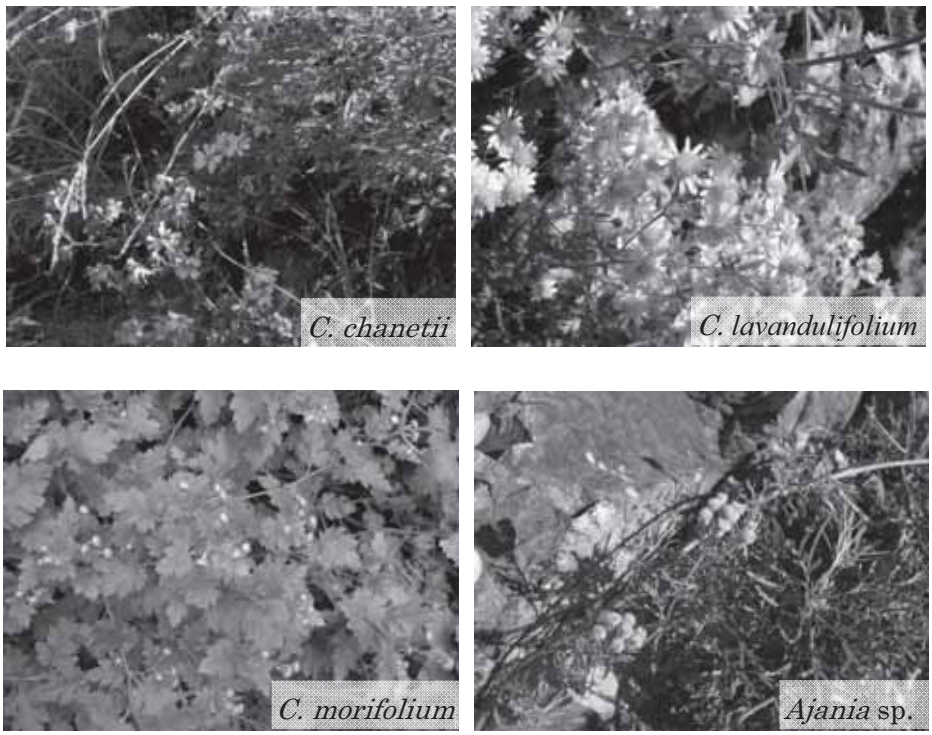

Fig. 1. Pictures of *Chrysanthemum* sensu lato collected.

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Nitrogen & Phosphorus Movements In Chieng Khoi Watershed In Vietnam

Bessy Kho Sze Ee
Masters 2nd year, Department of International Agricultural Science, Graduate School of Agriculture
Destination and period: Yen Chau, Vietnam, 16 February – 1 March 2011

Key words: Nitrate, Phosphate, Water Quality, Upland Area

(1) Contents and activities during the overseas field training

Title: Nitrogen & Phosphorus Movements In Chieng Khoi Watershed In Vietnam
Counterparts:
Hanoi University of Agriculture (Dr. Nguyen Thanh Lam)
University of Hohenheim (Dr. Gerhard Clemens)
Training Schedule & Content:
16 March 2011: Arrived in Hanoi.
17 March 2011: Meeting with Dr. Nguyen Thanh Lam and our field assistants (Ms. Nguyen Thi Thuy & Mr. Nguyen Xuan Huu) at Hanoi University of Agriculture. There was a short briefing on our proposed activities with input from Dr. Lam and a visit to the biotechnology laboratory, with explanation about their activities and machines used. Journey to Yen Chau started at 10.00am and ended at 3.30pm.
18 March 2011: A field excursion led by Ms.Thanh, a phD student of Hohenheim University, along the Chieng Khoi area and the Uplands Program office. Surface water sampling also started in the afternoon, with the help of Ms. Hoan, a field assistant of Uplands Program.
19 March 2011: Surface water sampling resumed.
20 March 2011: Ammonium, nitrate and phosphate concentrations, pH, EC and temperature parameters were measured and recorded for each sample. The results were discussed with my supervisor.
21 March 2011: 8 well water samples were taken from each of 3 villages, i.e. Ban Ngoang, Ban Tum and Ban Put, with the assistance of Ms.Ei Ei and Mr. Huu.
22 March 2011: The aforementioned parameters were measured and recorded for each sample.
23 March 2011: Well water samples were taken from the remaining 3 villages in Chieng Khoi area, i.e. Ban Heim, Ban Me and Ban Na Dong.
24 March 2011: Followed Ms. Ei Ei and Ms. Thuy to Son La city to retrieve some information about land

use in Yen Chau area from ministerial departments. After returning, the water samples were measured for the aforementioned parameters and readings were recorded.

25 March 2011: Assisted Ms.Ei Ei with her gas sampling activity at a paddy field in Ban Put.

26 March 2011: Assisted Ms.Ei Ei with her gas sampling activity in another paddy field in the same village.

27 March 2011: Return to Hanoi.

28 March 2011: Return to Japan on midnight flight.

Figure 1: Lanscape of Chieng Khoi area

The main environmental issue in Chieng Khoi area is soil erosion (Figure 1). Previous forestry activity started the soil erosion which was later aggravated by agricultural activities. The villagers depend on 3 main crops, i.e. rice, cassava, and maize. One effect of soil erosion is loss of nutrients. Thus, to increase soil fertility, they utilize livestock manure and chemical fertilizers. My field training was to see if there were any effects of agriculture on the surface water and the well water which they use for their daily lives, and how the Uplands Program is affecting the lives of the villagers.

(2) Findings and achievements obtained, significant experiences and lessons

The water samples analyzed showed that the ammonium, nitrate and phosphate concentrations in both surface water and well water are still satisfactory.

The field training has also been a useful practice in honing my skills in field sampling and doing on-site measurements. Pre-sampling planning has always been one of my main weaknesses. I learnt how to make more efficient planning through this experience. From other peoples' projects, I also observed that they used simple everyday objects such as bamboo or plastic bottles for their activities, such as sampling water. This is a cheap and innovative way, which also ensures the equipment will not get lost.

Observation on communication between the villagers and project staffs revealed that the staffs usually tried to avoid paying the villagers money for their participation. Instead, they would buy the fertilizers needed, or give packets of sugar. They also encouraged the villagers' involvement in project activities, such as to take care of the equipment and do simple tasks like applying the fixed amount of fertilizer on experimental paddy field plots. The staffs were always greeting the villagers, maintaining a good relationship with them. These methods enable the villagers to be more involved in the programme which ultimately aims to help the villagers themselves to attain a higher living standard.

Practicality in field activities and the importance of the affected society's involvement in the project, without use of money, are the 2 main ideas I received from this overseas field training. As for now, good pre-sampling planning will be an advantage when I do my own field sampling trip for my master's course.

From this experience, I believe that overseas field training can be better by highlighting to participants of the training about the many on-going projects in the developing countries so that they can

choose and plan their own trips. As each participant's interest is different from the other, planning on their own, with FOLENS office offering some guidance, is a good way to train their independence and critical thinking.

(3) Achievements and its future vision

What I learnt from this field trip is that for sustainable agriculture to succeed, patience is very important. Although the Uplands Program has been running for more than 10 years now, improved ways had to be introduced slowly into the farmers' conventional practices, as any drop in their crop yields can be a major influence on their daily lives (Pepijin, 2010). The Uplands Program is also unique in the sense that it is a win-win situation for all stakeholders. The villagers gain technical advice and the students and staffs learn to implement theories on actual situations.

The issues faced by the people in Chieng Khoi area are very relevant in South East Asian countries as forestry is an important economic activity in these countries. With intensive agriculture commencing after the forests have been logged or a shorter regenerative period, soil erosion and consequently the loss of fertile soil are a serious problem. However, people need food and money to survive. Thus, the only way out is to find a balance between peoples' needs and environment's needs.

Observations and lessons from the 2 week field training have inspired me to look into other similar projects from other places, to compare and collect more knowledge on sustainable agriculture.

(4) Acknowledgement

Special thanks to:

1. Dr. Gerhard Clemens, Coordinator of The Uplands Program, University of Hohenheim, Germany.
2. Dr. Nguyen Thanh Lam (Executive Director), Ms. Nguyen Thi Thuy & Mr. Nguyen Xuan Huu from Centre for Agricultural Research and Ecological Studies, Hanoi University of Agriculture.
3. The Uplands Program Staffs and Researchers.

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(Supervised by Kimura Sonoko D.)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Eco-balance Analysis on Rice cultivation systems related with Environmental Impacts and Farm Income

Ei Ei Theint (M1)
International Environmental and Agricultural Science
Graduate School of Agriculture
Destination and period: Hanoi University of Agriculture, Vietnam, 16th Feb -1st March 2011

Key words: GHGs emission, paddy fields, farmland surplus Nitrogen, Interview

(1)Contents and activities during the overseas field training

On 16th February, I went to the Vietnam for oversea fields training. Our group had four persons including my professor; Dr. Kimura Sonoko Dorothera. The title of my study was “Eco-balance Analysis on Rice cultivation systems related with Environmental Impacts and Farm Income”. I studied mainly two environmental impacts from rice cultivation systems. These are quantification of GHGs emission and farmland surplus Nitrogen from rice cultivation systems for Chieng Khoi watershed scale. For these two purposes, I collected the necessary data by interviewing with farmers, asking from the uplands office and collecting soil, water and gas samples from the paddy fields.

We arrived at Hanoi on 16th Feb at about 15:30 pm and moved to Yen Chau on 17th February. In the morning of 18th Feb, we went to the Chieng Khoi watershed areas for field observation together with the staff from uplands program and counterparts from Hanoi University of Agriculture. They explained us the land use system and the main problem of this area. Maize and cassava were intensively grown on the sloping fields and paddy rice was grown in the valley bottoms. The population of this area rapidly increases. To meet food demand for this population, farmers adopted two ways; use of chemical fertilizers and the expansion of agricultural land by clearing and changing the forest lands to agricultural lands. Therefore deforestation and soil erosion are common problem in this area (Maja Katharina Hertel, 2007).

(Fig.1) Hill Sides without cover

(Fig.2) Preparation for soil Erosion Experiment

Moreover the land use system of upland and lowland is connected and interrelated. Upstream erosion may lead to sedimentation and siltation of downstream water bodies and paddy fields as well as to nutrient transportation within sediments and irrigation. Furthermore, organic compounds present in the water also will influence soil fertility of paddy fields. This will impact not only on rice productivity but also the emission of green house gases that can contribute to climate change.

(Fig.3) Paddy fields at the valley bottom

(Fig.4) Irrigation from one field to other fields

In the afternoon of 18th Feb, I tried to get permission from headmen of 6 villages to be able to interview with farmers and to do sampling in the paddy fields. Data collecting by interview was conducted from 19th to 22nd Feb. Before interview, I explained them the purposes of this interview and my study plan with easy words that were not in technical terms. Mr. Huu, field assistant from Upland program translated from English to Vietnamese. It means I would like to contribute the local people from my knowledge that paddy field can give not only grain for foods but also have some environmental impacts. On 23rd Feb, I checked and summarized my data that received from interview. And then I collected the statistical data and the required map from the uplands program office. On 25th and 26th Feb, I made soil, water and gas sampling from paddy fields.

(Fig.5) Interview with farmers

(Fig.6) Gas sampling inside the paddy field

(2) Findings and achievements obtained, significant experiences and lessons

Chieng Khoi water shed area is located in Yen Chau district, North-west Vietnam. The elevation of this area is 300-800m. According to the data from interview, rice is cultivated two times per year and the average rice grain yield is about 6 ton/ha. Some farmers get very high yield about 12 ton/ha where the fields are at lower elevation. It may be due to sedimentation effect along the toposequence. Therefore, I made gas, soil and water sampling in two fields and 9 points per field. The objective of sampling is to evaluate whether there is any significant differences in methane and nitrous oxide emission within one field.

Moreover, to collect the factors influencing GHGs emission is very important in estimation for regional scale to reduce the uncertainties. Methane production rate is ordinarily high in flooded soils with high organic carbon content (Hou et al, 2000). Neue (1993) reported that reduced flooding duration increases N_2O production, whereas continuous flooding maintains an aerobic condition and enhances CH_4 production. Therefore, information about water management, organic matter management and agricultural practices were collected by interview.

In Chieng Khoi watershed area, irrigated rice area is (73.66 ha) and rainfed rice is (55.66 ha). Single drainage, double drainage, and multiple drainage are 6%, 44% and 50% of total area. Farmers use different organic amendments. 29% of total area is used compost. 54% is Green manure plus animal manure. 3% is human manure plus animal manure plus green manure. 5.7% is human manure plus animal manure. 5.7% is animal manure only and 3% is used no organic amendments. These all data will provide more accurate estimation of green house gases for Chieng Khoi watershed scale.

During this training, I realize the procedure for permission to do research in farmers' fields (e.g; how to discuss and make contract with farmers). Another opportunity is that in Chieng Khoi area, uplands program has been conducted since 2000. It is long term research collaboration between Hohenheim University and seven universities and research institutes in Thailand and Vietnam. We met students from Germany, American, Vietnam and some staffs from this program. Every day, we had dinner together and got a chance to communicate with them. During dinner time, we can share about study plan each other. Moreover, some information for the data source can be obtained from the conversation at dinner time because this program had been conducted since 2000 and many researches had already done. Therefore, communication skill and language efficiency is very important to exchange the knowledge and information

from each others.

Moreover, I joined to another interview that was made by uplands staffs. Before making interview, they made test whether the farmers can understand their questions easily or not, how long does it take for interview and some items need to be added or not. If some questions are difficult to answer, they modify their questions. Ms. Thanh Nguyen, researcher from uplands programs explained me that the optimum time of interview for one farmer should be 20-30 minutes based on her experience. Because farmers may be busy with their fields' work and they will feel boring if the interview is too long. Finally, I would like to say that field survey is necessary before conducting research to know about actual field condition and problems. Therefore, it was new and good experience for me to become environmental leader.

Figure (6) Joined to the another Interview by uplands staff

Another important thing to become good environmental leader is adaptability in local area easily and communication manner to get friendship with local people by expressing the respect to their culture.

(3) Achievements and its future vision

Conservation of natural resources is very important to improve the living condition of one region. Therefore, scientific research findings play a vital role to contribute the appropriate technology to prevent the degradation of natural resources. Leading of stakeholders, transfer of technology through extension workers and active participation of local people are also very important to be a successful work. At first, a good way to adopt a new technique is learning by seeing by demonstration of the technique. Second step is learning by doing themselves. In addition, support and encouragement of stakeholder and international cooperation can lead to the solution of environmental problems.

(4) Acknowledgement

Field experience is necessary to become good environmental leader. This overseas field training gave valuable experience. Therefore, I would like to gratefully acknowledge to TUAT and FOLENs program for providing this opportunity. And I would like to express my sincerest thanks to my supervisor, Dr. Kimura Sonoko Dorothea for her suggestion and encouragement to be successful of this study. Moreover, I am especially grateful to Dr. Tran Duc Vien, Rector of HUA and all staffs from upland programs. I am deeply indebted to my friends, Bessy and Aung Zaw Oo for assisting me in field sampling.

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(Supervised by Dr. Kimura Sonoko Dorothea)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Agriculture and environmental management in Thailand

Jameekorn TUNGSOMKID
Master course, IEAS, Tokyo University of Agriculture and Technology
Destination and period: Thailand during on 20th Feb – 21st March, 2011

Key words: environmental management, royal project, sustainable development, waste disposal management, waste water treatment

(1) Contents and activities during the overseas field training

I went to overseas field training with Associated Professor Hirotaka SAITO. The title is agriculture and environmental management in Thailand. The aim of this trip is to study the agriculture, irrigation systems and environmental management. I visited Laem Phak Bia Project, Royal Chitralada Agricultural Projects, Doi Tung- Development Project and Huay Hong Kri Project. There are Thailand's Royal Projects. I studied sustainable development in agriculture and waste disposal and wastewater treatment. At Thai Organic- Farm I studied agriculture. At Sirindhorn International Park I studied conservation of nature and environment. At Maemohmine I studied environmental management. At Siam Food Company Limited I studied irrigation systems and appropriate wastewater treatment. At Wongpanit I studied waste management.

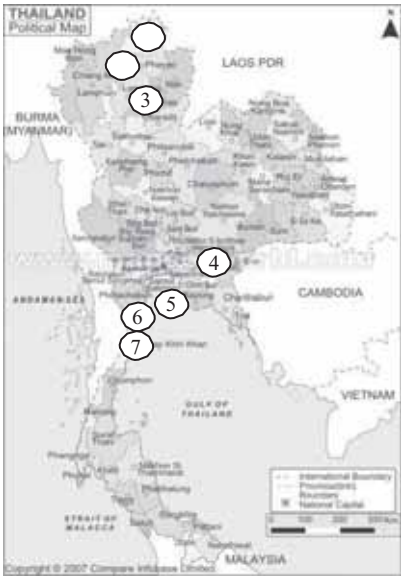


Figure 1: Political map of Thailand

The position of province is shown in Figure 1

1. Doi Tung- Development Project (Chiang Rai)
2. Huay Hong Kri Project (Chiang Mai)
3. Maemohmine (Lampang)
4. Wongpanit (Nakornratchasima)
5. Royal Chitralada Agricultural Projects (Bangkok)
6. Thai Organic- Farm (Ratchaburi)
7. Sirindhorn International Park and Laem Phak Bia Project (Phetchaburi)

(2) Findings and achievements obtained, significant experiences and lessons

I learned through the royal projects as "one-stop service" where people can visit to see demonstrations of new methods and techniques. In this study it is not directly related to my Master's thesis but I had a good chance to learn many things. I got new experience, learning King's philosophy and can follow in the footsteps of King. If I have a chance to be leader. I will show sincerity to subordinate people and show or tell to everyone that we should conserve and live appropriately with natural.

Royal Chitralada Agricultural Projects

The projects rely on scientific and technological progress in conducting studies, research and experimentation. They are fully operational in order to promote and disseminate the knowledge by demonstrating of simple methods suitable for individual farmers and all people who are interested. The projects are divided into two types: Non-profit and semi-profit, give to the long-term improvement of the farmer's quality of life so they could become self-sufficient, and at the same time conserve the natural resources. The projects operate on a non- profit basis, including experimental rice fields, demonstration forest, culture of Nil fish, wind mill, cold water production by means of heat energy from husk, solar energy house, solar cell-powered water pumping system, electricity generation by wind power, Sa mulberry paper production, and plant tissue culture. The semi-profit projects include dairy farm and dairy products, agro-technologies, and experimental fuel production units.

Doi Tung Development Project

In former times highland tribe in Doi tung planted opium but opium has addictive substance and illicit. The purpose of this project is to solve the problem, to improve soil in this area, and to people. It is a holistic and integrated sustainable alternative livelihood development initiative. Now they have good living conditions than they had in the past.

The Huai Hong Khrai Royal Development Study Center

The project is aimed to conduct research and experiment to develop appropriate methods which fit the needs of the Northern region of Thailand particularly for the conservation of natural resources, environment, agricultural development, and for the development of the basin management skills (Figure 2). This project will help the local to increase their earnings.

(a) (b) (c)

Figure 2: (a) Floating fish basket, (b) Mushroom culture, and (c) Frog culture by using tire (condo frogs)

The Leam Phak Bia Environmental Study (LERD)

Science and knowledge to solve the wastewater and waste problem were researched and technologies were built. There are four main technologies concerning wastewater treatment (Figure 3):

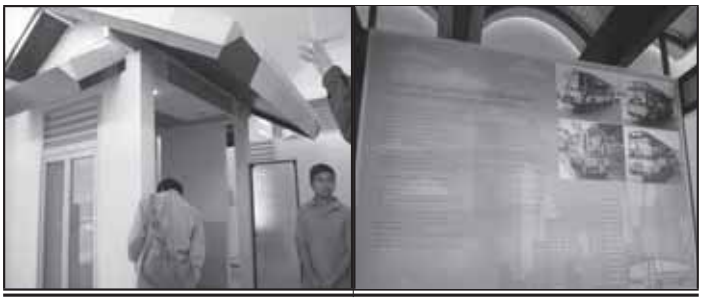
1) Oxidation pond treatment system
2) Grass filtration system
3) Constructed wetland system
4) Mangrove forest filtration system

(a) (b) (c) (d)

Figure 3: (a) Oxidation pond treatment system, (b) Grass filtration system, (c) Constructed wetland system (Cyperus corymbosus Rottb), and (d) Mangrove forest filtration system

The Sirindhorn International Environmental park

There is an environmental center about conservation of energy and environment. It relates to science and technology in Thailand and aboard. It is the learning through local wisdom. Figure 4: (a) shows the example of designing energy-efficient house and how to choose the material for saving energy. Designing energy-efficient houses should adapt the amenities provided by modern technology and incorporate them into the traditional style houses that are appropriate to climate and geographical location. These types of traditional-style houses do not need a large amount of energy. Fig 4: (b) shows how to travel safely and economically by public transport.



(a) (b)

Figure 4: (a) shows the example of designing energy-efficient house, and(b) shows how to travel safety and economically by public transport

Mae Moh Mine

Electricity is essential to modern living styles. It is indeed a basic infrastructure for economic and social development of a country. Environment is always prime concern at Mae Moh. Environmental impact assessment and well-planned environmental impact mitigating and monitoring measure are extensively implemented to control air quality, water quality, noise level, and vibration. ISO 14001 have been adopted for the efficiency of environmental management, quality of work and safety, mined land reclamation, and quality of life improvement for sustainable development for community such as vocational development, education and child support, health promotion and support, infrastructure development, etc.

Siam Food company Limited

Siam Food Products Public Company Limited processes canned pineapple slices, pineapple juice concentrate, and tropical fruit cocktail. Approximately 99% of Siam Food's products are exported to many major markets, such as the U.S.A., the United Kingdom, Japan, Germany, the Netherlands, France, Italy and Spain. Siam Food Products Public Company Limited is a world renowned manufacturer of premium quality food with high safety standards, meeting international requirement of environmental, to develop the environmental, occupational, and health and safety management system to compliance with legal requirements.

(a) (b) (c)

Figure 5: (a) sprinkler irrigation, (b) compost waste from pineapple plant, and (c) equalizing pond

Thai Organic Farm

Thai Organic Food Company Limited has been certified by Organic Agriculture Certification Thailand, accredited by IFOAM. It has an area of 6 hectares. They utilize resources effectively. Production factors; for example, composts, are produced within their farm. They are the leading organic vegetable supplier in domestic market. The products are displayed in over 20 branches of Bangkok's five major supermarkets.

Wongpanit

At Nakhornratchasima province, there is too much garbage about 1,800 ton/day. Wongpanit company has cooperated with Nakornratchasima provincial administrative organization to solve the problem. They teach people to separate garbage before throwing away. They accept to buy garbage from people. People get money by selling the garbage and garbage is decreasing.

(a) (b)

Figure 6: (a) Lecturer teach people to separate garbage, and (b) local businessman

(3) Achievements and its future vision

His Majesty King Bhumibol Adulyadej has expounded the concept of "Sufficiency Economy" to the Thai people. Sufficiency Economy" is a philosophy that stresses the middle path as an overriding principle for appropriate conduct at all levels of society, individuals, households, community, organizations or government. His Majesty's wisdom has earned not only respect and admiration within Thailand, but also throughout the international community. I believe it can help our long-term quality of life. We start doing them by ourselves. For example; decrease importing productions, not use chemicals in agriculture, use effective microorganisms (EM), learn waste water management, and recycle water. I think it is the concrete way to be aware of environmental issues and approach to sustainable development.

(4) Acknowledgement

During one year's master study, I got advice and teaching from FOLENS staff who are kind. Thank you everyone and Saito sensei who is my supervisor. I will remember all the things that they did for me. Because I know there is a lot of worth for me to learn in my future life.

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(Supervised by Associated Professor Hirotaka SAITO)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Anammox bacteria in the sediment of Chao Phraya River and Pasak River

Ryo HIGUCHI
1st grade of Master, Chemical Engineering, Tokyo University of Agriculture and Technology
Destination and period: Thailand, August 27 - September 4, 2011

Key words: Thailand, Kasetsart University, Chao Phraya River, Anammox

Abstract

Currently, they have not treated water precisely in Thailand, it caused to precede water pollution. For considering these conditions, it is required to understand their problems and lifestyle.

Research topic is the investigation of Anammox bacteria in the sediments of Chao Phraya River and Pasak River. The fraction of DNA was extracted from each sediment sample, and PCR analysis was performed with a primer set for Anammox bacteria. If it confirmed the present of Anammox bacteria, they will be identified to some kind of Anammox bacteria and quantification. Finally, compared with the Anammox of Koisegawa River, in which its presence and activity has been studied as a part of my master thesis. It may be the evidence of difference between Japanese river and Thailand river. As a result, it was shown the possibility that there were some Anammox bacteria, but they were different kind of Anammox bacteria from Koisegawa River.

Finally, fly out from Japan and watch the one of abroad country, clearly come to feel the difference between own country and abroad country, then look again own country, Japan. On the basis of this experience, I would like to consider the way to improve Japan.

(1) Contents and activities during the overseas field training

The field Training in Thailand was implemented between August 27th and September 4th, under supervising by Professor Akihiko Terada.

Training time schedule: August 27th, arrived at department of agriculture in Kasetsart University and discussed with Professor Tiwa Pakoktom (Associate Dean for Administration, Faculty of Agriculture at Kamphaeng Saen, Kasetsart University). August 28th, sampling a river sediment at Chao Phraya River and

Pasak River. August 29th, experiment for DNA extraction at laboratory. August 30th, experiment for measuring concentration of DNA with Nanodrop and performed PCR. August 31th, discussed about experiment result and visit an entomology museum. September 1st, visit Regional Environmental Office 8 (REO8) and landfill site in Hua Hin. September 2nd, transferred to the department of engineer in Kasetsart University. September 3rd, shopping at Sunday market and introduce myself and exchange of ideas with Kasetsart students. September 4th, return to Japan.

In this training, I focused on Anammox bacteria in Thailand River. Anammox is the reaction root of anaerobic ammonium oxidation. This reaction is very efficiently if it applied to waste water treatment. Moreover, Anammox reaction does not pass through the nitrous oxide though usual way passes through. Nitrous oxide has high potential as green house gas. When the way which passes through the nitrous oxide proceeds, it causes to great emission the green house gas. Therefore Anammox has low risk for environment. These Anammox bacteria are discovered in high load of nitrogen such as a waste water treatment plant. But nowadays Anammox bacteria are reported to live in natural environment such as sea or river. If there are more reports about discovery of Anammox bacteria in natural environment, the physiological mechanism of them will become clear. It will be the basis for the practical application of Anammox to waste water treatment.

In the result of my graduate study, I discovered the Anammox bacteria in the sediment of Koisegawa River in Ibaragi prefecture in Japan where highly loaded nitrogen is dissolved. In Thailand, it is said that there are serious water pollution in some river; it is considered that these river could contain high concentration of nitrogen.

Hence, I will research for Anammox bacteria in the sediment of some Thailand river through the field training. At first, qualitative for Anammox bacteria in some Thailand river under the way; sampling the sediment at some river, extract DNA, experiment for PCR with primer set for Anammox bacteria. If it confirmed the present of Anammox bacteria, experiment for identification to some kind of Anammox bacteria and quantification. Finally, gained data will compared with the Anammox data of Koisegawa River. It will be possible to the evidence of difference between Japanese river and Thailand river. Furthermore, since the ecosystem of Anammox in the inland river is not so clarified, this research will be the novel bases of Anammox.

Currently, they have not treated water precisely in Thailand, it caused to precede water pollution. For considering these conditions and propose any ideas for improve, it is required to understand their problems and lifestyle. In these days, many Japanese companies move in Thailand, it can say that they contribute to developing their economy. But also it can promote the environmental pollution. If there are many Japanese cars which exhaust the large amount of gas in whole driven in Thailand, it is caused to the one of main reason for the pollution. Therefore these companies should act for improve their environment willingly. So we should support their development, and also we should lead with adequate approach to prevent from pollution disease such as occurred in period of high economic growth in Japan.

(2) Findings and achievements obtained, significant experiences and lessons

Through the experiment on the oversea training, gain the extracted DNA from sediment in Chao Phraya River and Pasak River. The result of PCR is shown in figures 1 and 2. In these figures, the word on the picture “P” means positive control which consists of the DNA of already known Anammox bacteria. “N” means negative control which does not include DNA but only water, and it proves that there is no some contamination in the experiment. “Chao” means DNA sample gained from Chao Phraya River sediment and “Pasak” means from Pasak River sediment. The left edge line indicates the length of DNA.

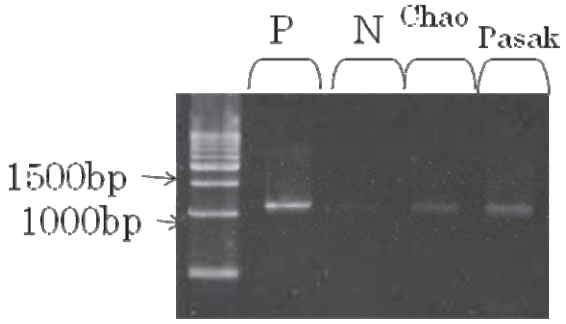

Figure 1 DNA analysis with PCR
(primer set Amx368f - Amx1480r)

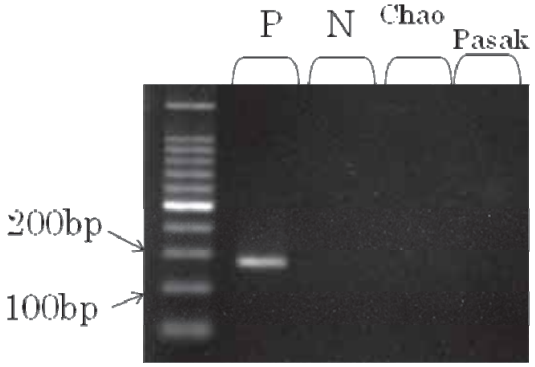

Figure 2 DNA analysis with PCR
(primer set Amx818f - Amx1066r)

In the result, these DNA samples were confirmed the possibility to exist the Anammox bacteria. Figure 1 shows the result of PCR with the primer set Amx368f and Amx1480r. This primer set can amplify almost all Anammox bacteria DNA. According to figure 1, DNA samples from Chao Phraya River and Pasak River are emitted line on the same position of the positive control. But these samples light weakly, there may be a few Anammox bacteria. The next, primer set Amx818f and Amx1066r can amplify specific kind of Anammox bacteria which are discovered to live in waste water treatment plant or natural environment. In previous study, the DNA samples from Koisegawa River sediment are amplified. But, according to figure 2, it shows the absence of the already known Anammox bacteria. This result indicates the possibility that there are some Anammox bacteria, but they are different kind of Anammox bacteria from Koisegawa River. Therefore, it is required to prepare the new primer set specific for another kind of Anammox bacteria, or to analyze DNA arrangement with the method of cloning and sequencing for more detailed investigation of the species of Anammox in these rivers. When I saw some problem in Thailand, it gave me great impression. First, the water problem is the most familiar, I felt. It seemed that there are few technologies installed for water treatment, so tap-water was not recommended to drink. I could see the bottle water in anywhere and people always drink it. The one of reasons may be that Thailand is covered with a little forests, it caused being shorten the retention time of surface water lead to lack of natural purification. So the flowed raw water cannot receive the benefit of purification from forest. I think they need not only the new water treatment plant but also the way of non-point source counter-measures for the flat area because the problem is widely covered. The second, we had opportunity to visit the final disposal site in Hua Hin. The place has been over the limit of years to run for reclamation, but they have continued to accumulate of garbage because there is no new land for reclamation. As a result, it has risk that the leachate flowed into near the river. When people

live in rich, the large amount of garbage ejected could be inevitable. Therefore, ensure the land for reclamation will be required in anywhere. Moreover, the recycle system will be required for sustainability. We should consider about the way of using limited resource as one of crew of the earth. If there are any space and enough money, they should install the system which can gain from any waste.

In the Kasetsart University, I felt some differences of Japan and Thailand. It seemed that Thailand encourage education and investigation positively. The University students have to wear the uniform the reason why students have not to discriminate by the disparity of wealth from their clothes. And more, some company recommended employing the graduated doctor student contrast to Japan. These things are important for developing investigation level. But Japan does not tend to so positively for investigation. So, this opportunity to observe abroad country would be the time to look again own country. I think if we observe own country like a foreign country, we may find out the new aspects or the novel way for improving problem which burdened on Japan.

(3) Achievements and its future vision

Through the training in Thailand, I thought that this country is not so poor developing country, but people live in actively and the growth of cities is promoted. But there are some problems of infrastructure such as the water. When I saw the field of problem, I thought that they need not excellent technology but rapid basic treatment. Nothing to say, studying to learn knowledge is very important, but the beginning with a little step to execute is more practically and realistically.

Since fly out from narrow field Japan and watch the one of abroad country, clearly come to feel the difference between own country and abroad country, then look again own country. I would like to search for anyway to improve for Japan, for not to reach a dead end.

When I observed Thailand life style, I thought that I can live in there. This oversea field training would reduce my reluctance to live in abroad country. I can not use English fluently and correctly yet, but I think that the smattering English with the enthusiasm and strong hope to communicate will be recognized.

This experience strengthens my challenge spirit. A field unknown for me has usually anxiety and it make me hesitate. But when I stood on the field where no way of escape, I felt the brave to proceed my way, and I noticed that there are little or nothing barrier. I studied that the experience like this can expands my horizons right away. I want to continue the challenges which can do as this experience. Pass through it, I would like to my life more fruitful.

(4) Acknowledgement

I would like to thank Kasetsart university students for technical assistance and professors for arrangement. And I would like to thank FOLENS stuff for giving the great opportunity.

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(Supervised by Akihiko Terada)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Investigation of the bacteria limiting green house gases emission in the rice paddy in Thailand

Miu Kamimura
1st year Master's degree student, Department of Applied Chemistry, Tokyo University of Agriculture & Technology (TUAT)
Destination and period: Thailand, 27 Aug. – 4 Sep. 2011

Key words: rice paddy field, greenhouse gases, Chao Praya River, bacteria

Abstract (approximately 200 words)

In recent years, greenhouse gases emission from agricultural field is one of the serious environmental problems around the world. In addition, the rice paddy is the main source of methane, one of the greenhouse gases. Thailand has rice growing culture. The crop area in Thailand is 10.94 million ha. And Thailand has a No.1 share of quantity of export in the world in 2009. It is said that Rice cultivation in Thailand has the big impact for the environmental problem. For the approach against the problem, knowledge about process of producing or using green house gases by microorganisms in the rice paddy is necessary.

With considering this situation, the bacterial status and environmental status of rice paddy, such as surface water quality, are especially studied in this oversea training. On this training, I focused on the bacteria that used methane and not produce nitrous oxide in the reaction process. And I would like to establish a causal connection between bacteria and environment status.

Soil and surface water samples were collected from the 3 rice paddy fields. One sampling point is directly connected to the Chao Praya River, and its wastewater flow into the river (sample 1). The other sampling point is in the industrial area (sample 2). And last sampling point is in the Kasetsart University (Kamphaeng Sean Campus) site (sample 3). But water sample was not collected in sampling point 3 because of lack of preparation. DNAs of all bacteria were extracted from the rice paddy soil. (Extracted DNA PCR analysis) Unfortunately, the bacterial class could not be identified from the samples of rice paddy connected to the Chao Praya River and in the industrial area. The result suggested that the bacteria are minority in these rice paddies another sample will be analyzed.

(1) Contents and activities during the overseas field training (less than 600 words)

Title of your Overseas Field Training

Investigation of the bacteria limiting green house gases emission in the rice paddy in Thailand

Names of the counterparts and professors

- Lecturer Akihiko Terada (supervisor)
- assistant professor Yoneda
- Ph.D. Tiwa PAKOKTOM（Kasetsart University）
- visiting professor Eiichi Kawai（Asia Science and Education for Economic Development :Asia SEED）

Training schedule

27 Aug. Go to Thailand, Kasetsart University (Kamphaeng Sean Campus)
28 Aug. sampling soil and water at Chao Praya River, 2 rice paddy fields
& sightseeing (Ayothaya floating market)
29 Aug. tour of the faculty of Agriculture & experiment at Kasetsart University (Kamphaeng Sean Campus)
30 Aug. experiment at Kasetsart University (Kamphaeng Sean Campus)
31 Aug. experiment & tour of Kamphaeng Sean Campus
1 Sep. sampling at Huahin　final dumping place for household garbage in Ratchaburi province
2 Sep. experiment at Kasetsart University (Kamphaeng Sean Campus) & move to Bangkok
3 Sep. (morning) sightseeing (Saturday market)
(Afternoon) presentation about our research in Thailand to student s at Bangkhen Campus
→Suvarnabhumi international Airport (Bangkok)
4Sep. Go back to Japan

(The total period: 9days)

Main training content

The research topic is to investigate the behavior of the bacteria that contribute to reduce greenhouse gas (GHG) emission such as CH_4, and N_2O in rice paddy field. They are some special bacteria called Denitrifying Methanotrophic bacteria of NC10 phylum that can convert NO_3^- into N_2 by using CH_4 as electron donor. That is to say NC10 phylum bacteria oxidize CH_4 coupled to denitrification. They are observed in freshwater sediment and rice paddy field soil. But knowledge about the bacteria is not enough to utilize for water treatment by bioreactor or on-site treatment. Then, I study about the behavior of the bacteria in rice paddy field in Thailand.

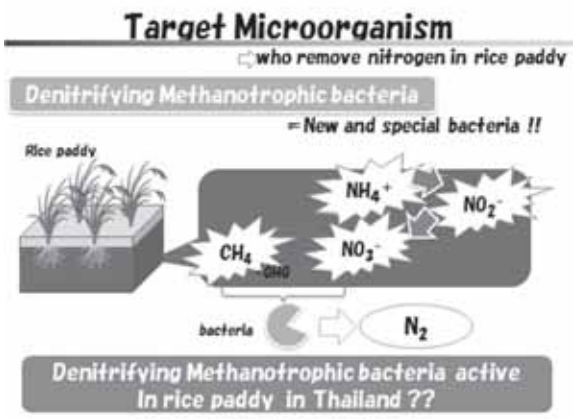

Figure 1

The purposes of this fieldwork and study in Thailand are 1) water quality analysis 2) detection and quantification of NC10 phylum bacteria in rice paddy field in Thailand.

In previous studies, the connection between bacteria and environment situation.

In my study, I would like to establish the connection such as relativity between the bacteria population and environment situation.

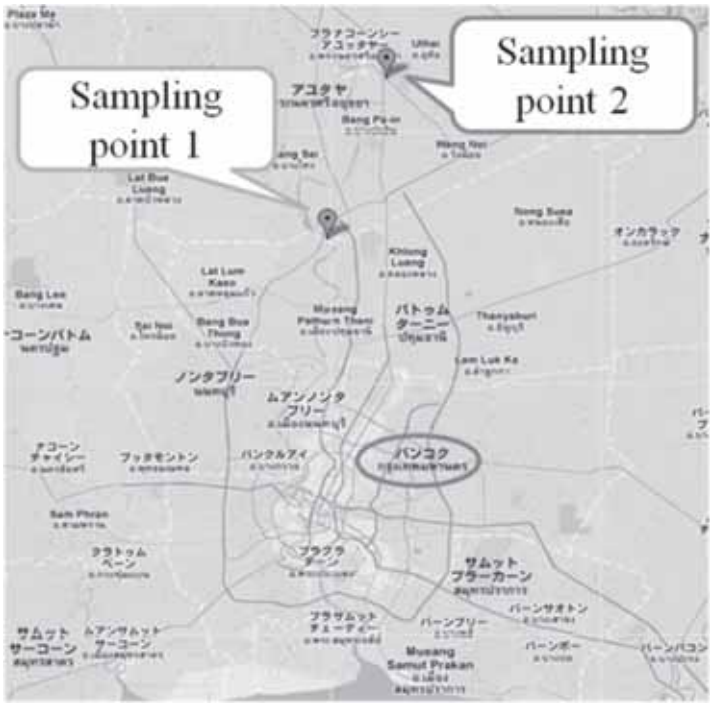

Figure 2 Map of sampling point

Sampling

I collected 3 types of sample; rice paddy soil, rice paddy surface water. Rice paddy soil samples were collected for analyze about bacteria population. Rice paddy surface water samples were collected for measuring same environmental status, such as pH, Eh, temperature, DO, NH_4^+, NO_2^- and NO_3^-.

And these samples were collected from 3 rice paddy fields. Sampling point 1; it is directly connected

to the Chao Praya River, and its wastewater flow into the river. Sampling point 2; it is in the industrial area. Sampling point 3; it is in the Kasetsart University (Kamphaeng Sean Campus). Sampling points are shown in Figure 2. Rice paddy soil samples for analyzing about bacteria are collected from each site. But water sample for measuring pH, Eh, temperature, and DO was collected at only sampling point 2. These statuses were not measured at sampling point 1 and 3. It is because sampling point 1 is harvested field; accordingly I could not get enough water samples to measure these statuses. And I could not collect water samples because of lack of preservation at sampling point 3. Surface water sample for measuring NH_4^+, NO_2^-, NO_3^- were collected at sampling point 2. At sampling point 1 and 3, I could not collect the water sample same reason described before.

Chao Praya River (not sampling point)

sampling point 1

sampling point 2

sampling point 3

Figure 3 Chao Praya River and sampling points

Experiment

1) Water analysis

Water samples were filtered a membrane filter with 0.45 μm in pore size. Then, NH_4^+, NO_2^-, NO_3^- in water samples were measured with an ion chromatography analyzer after coming back to Japan.

2) Detection NC10 phylum bacteria in rice paddy field

Bacterial DNA from soil samples were extracted with Extrap Soil DNA Kit Plus ver.2. The extracted DNA concentration was measured by spectrophotometer for check quality of extracted DNA. And I try to detect NC10 phylum bacteria by polymerase chain reaction of extracted DNA. After that, I will identify the bacteria class in neat future.

Other activities

- Sampling at Huahin final dumping place for household garbage in Ratchaburi province

We took some samples (water in the observation well, leachate), one of the student measure heavy metal contained in them.

Figure 4 Huahin final dumping place

- Presentation about our research in Thailand to students at Bangkhen Campus

Students from TUAT and Prof. Terada gave presentation about each study by PowerPoint to the Kasetsart University students at Bangkhen Campus. And we exchanged opinions.

Figure 5 Presentation at Bangkhen Campus

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

Result and Discussion

Concentrations of NH_4^+, NO_2^-, NO_3^- in rice paddy surface water is shown in Table 1. And environmental status in sampling point 2 is shown in Table 2.

I extracted bacterial DNA from rice paddy soil samples. These extracted DNA is adequate quantity and quality.

I tried to amplify DNA of NC10 phylum bacteria by PCR (polymerase chain reaction). But I could not amplify their DNA (data is not shown in this report). And I tried to quantitate the number of NC10 phylum bacteria by real-time PCR. But the quantity of DNA of NC10 phylum bacteria is less than lower detection limit. That is to say, very few or no NC10 phylum bacteria live in rice paddy field in Thailand. Or there are NC10 phylum bacteria which have different type of DNA sequence from previously detected NC10 phylum bacteria. But I have already detected and quantify NC10 phylum bacteria form the Japanese rice

paddy field soil samples.

Why are there very few or no NC10 phylum bacteria which is detected previously? I think that there are a lot of reasons. For example, temperature, soil type, fertilizer component are different between Japan and Thailand. I could not determine that which factor is dominant for comfortable living of NC10 phylum bacteria. Because there is no data about NC10 phylum bacteria live in rice paddy field soil now. Therefore, I have to assemble data (type and amount of NC10 phylum bacteria, environmental situation) in variety of rice paddy fields.

Table 1 Concentration of NH_4^+, NO_2^-, NO_3^- in surface water

	sampling point 2
NH_4^+[mg/L]	n.a.
NO_2^-[mg/L]	n.a.
NO_3^-[mg/L]	0.21114

Table 2 environmental status of rice paddy surface water

	sampling point 2
pH	5.6
Temp.	33.4°C
DO	4.0

From other activities

① Problem of garbage

I realize that the problem of garbage is really serious in Thailand. I was very shocked to have looked the case of Huahin final dumping place. And people in Thailand have less concern about garbage than Japanese.

In Huahin final dumping place in Ratchaburi province, there are a lot of household garbage. And dumping place area is expanding now. In addition to, there may be environmental problem such as external pollution by seeping water from the final dumping place, because there is no barrier around the final dumping place.

People did not classification of the garbage. Some people throw out waste to environment in some living area. I found that local people do not concern about the problem very much.

Why does Thailand have the problem of garbage? I consider that the reason is rapid economic development. And rules on garbage are not enhanced sufficiently. For example, Thailand does not have rule of separating garbage. So people does not concern about throwing garbage. It is important to tell people the problem and to apply the problem for researchers in environmental sectors.

② Communication with people in Kasetsart University

I felt that communicate in English is not difficult in this field work. I had a lot of chance to communicate in English such as experiment and presentation in Kasetsart University. The experience gave me activeness to communicate in English. And I would like to speak English more fluently and naturally for more smooth communication. Therefore I would talk in English if I had chances to do in my everyday live. And I would like to have communication with students in Kasetsart University on the internet.

(3) Achievements and its future vision (less than 400 words)

○Achievement in experiment

I could not detect the NC10 phylum bacteria in Thailand rice paddy field on this field trip.

For the future, I am going to collect samples and analyze in some rice paddy fields. And I am going to discuss the reason why NC10 phylum bacteria were not detected.

And measurement of methane gas emission from rice paddy field is important. For the future, I would like to discuss the relativity between NC10 phylum bacteria and methane gas flux from rice paddy field and environmental status.

Finally, I would like to establish a causal connection between NC10 phylum bacteria and environment status of rice paddy field and greenhouse gases emission from rice paddy field (especially methane) in Thailand and Japan.

○Achievement in friendship

In addition to, this field training links with own master course study deeply. Therefore the data are very important at the point to grasp a characteristic of the behavior of the bacteria group which I pay my attention. And there was the person who has same question in the other countries, and studied it. I could recognize the importance of my study in terms of focusing on special bacteria and trying to establish causal connection to environmental status.

In this field training, I could make friendship with Ph.D. Tiwa and his students of Kasetsart University. We exchange experiment data mutually after the field training.

○Making use of the experiences of this field work

This field trip is my first experience of non-sightseeing activity abroad. So there were a lot of uncontemplated events in the field trip. I could not use tool which is similar to tool I use in Japan. And I did not have enough time to get greenhouse gas samples from rice paddy field, because I did not get to know sampling schedule detail preliminarily. I did experiment hardly in unaccustomed laboratory. As seen above, I realized that work abroad has many difficulties. But I also realized that I could cut down these difficulties by advance preparation and smooth communication. These are necessary to work abroad in the future. Hence, I have to build the sufficient skill to tell someone my thinking in English. And I have to prepare sufficiently to respond to uncontemplated events in every activity. I think that all experiences in the field trip are good motivator to build myself for working abroad in the future.

Figure 6 School lives in Kasetsart University

(4) Acknowledgement

I am deeply grateful to Prof. Tiwa, Prof. Kawai.
I want to thank Ms. Joe and Mr. Gi and laboratory member of Kasetsart University
I received generous support from Hosomi & Terada Lab. Member.
I would like to express my gratitude to Prof. Hosomi.
And I have had the support and encouragement of member of this field training, Prof. Terada, Prof. Yoneda, and Kazuya, Ryo.

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(Date of access 9 Nov. 2011)

(Supervised by Prof. Akihiko Terada)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Research on water quality and water problems in Ghana

Tomoko Makita
Master course, Department of Environmental Science on Biosphere,
Tokyo University of Agriculture and Technology
Republic of Ghana: September 5−18

Key words: Ghana, water pollution, water resource management

Abstract

My overseas field training in Ghana was carried out from September 5 to 18 in cooperation with the University of Ghana and Kwame Nkrumah University of Science and Technology. In this program my objective was to consider environmental problems from the viewpoint of science, as well as the social aspects. As a FOLENS student, I planned to obtain the skills to gather information on the environment in an unknown field and to work out the causes of the environmental problems. In particular, I focused on environmental problems relating to water.

Basic properties (water temperature, pH, COD, the concentration of dissolved oxygen, NO_3^-, NO_2^-, PO_4^{3-} and SO_4^{2-}) were measured for 15 samples (five drinking-water, eight river water, one puddle water at a damping site) from different locations (Accra, Kumasi, Obuasi and Gomoa Dahom).

I also conducted an interview on the problem of water resources with Mr. Michael Onwona, who works for the Environmental Protection Agency of Ghana. This gave me invaluable information about Ghana's water problems in terms of the society and government policy.

From this research I managed to establish the effect of inadequate water purification systems on water quality, the demand for sewage and wastewater treatment (especially in the gold-mining area) and the difficulties of water quality monitoring in Ghana.

Ghana is an economically developed country compared with other countries in Africa, so it may well be an indication of the kinds of environmental problems that will be seen in future in the whole of Africa.

(1) Activities during the overseas field training

The overseas field training in Ghana was carried out from September 5 to 18 in cooperation with the

University of Ghana and Kwame Nkrumah University of Science and Technology. In this program my objective was to study the environmental problems from a scientific viewpoint, as well as the social aspects. As a FOLENS student, I planned to gain the skills to gather information on the environment in an unknown field and to work out the causes of environmental problems.

I focused on environmental problems relating to water, both because water is a crucial resource for people, and because I was concerned that an inadequate sewage treatment system was causing eutrophication and local soil pollution, thereby directly affecting local water quality. The title of my study was "Research on water quality and water problems in Ghana."

Water quality research (chemical analysis)

To evaluate the quality of the water the local people drink and that is discharged into the environment, I measured basic properties (water temperature, pH, COD, the concentration of dissolved oxygen, NO_3^-, NO_2^-, PO_4^{3-} and SO_4^{2-}) for 15 samples (five drinking-water, eight river water, one puddle water in a damping site, one lake water) from four locations (Accra, Kumasi, Obuasi and Gomoa Dahom) using simple instruments and a few chemicals (Figure 1). After returning to Japan, these samples were measured precisely using ion chromatography.

Figure 1. Chemicals for measurement

Each location had a different character. Accra and Kumasi are urban areas, with only partial water supply and sewerage treatment systems. Obuasi has many gold-mining sites and is without a sewage treatment system. Gomoa Dahom is a village located in a rural agricultural area.

Presentation

At the beginning of the program we had an opening session with Professor John Ofosu-Anim, Professor Edward Benjamin Sabi, and students from the University of Ghana. We gave a presentation about the environmental problems in Japan and the objectives of our study during the stay in Ghana. We received some informative comments and thought-provoking questions, and the audience seemed to be highly interested in the water purification plant in Japan.

Opportunity to learn about the local society

We visited a number of areas where we were able to observe the life-styles of the local people. In the gold-mining area, Obuasi, we looked around the gold-mining site and communities. In the village with a traditional life-style, Gomoa, we were able to observe the agricultural land and typical traditional life-style. In these sites some local people expressed anxiety about water resource problems, disease and parasites caused by untreated water.

Interview

At the University of Ghana, I conducted an interview on the problem of water resources with Mr. Michael Onwona, who works for the Environmental Protection Agency of Ghana (Figure 2). I obtained a lot of information on water problems, both from the social and the political aspects.

Figure 2. Interview with Mr. Onwona

Discussion with Ghanaian students

On the last day in Ghana we had a closing session with students from the University of Ghana about the environmental problems in Ghana and the necessity of environmental education.

Water problems in Ghana

In the results of the water quality research on drinking-water (Table 1), tap water from Acrra and well water from Obuasi (Figure 3) showed equal values with Japanese tap water. However, the tap water from Kumasi and the packed drinking-water (Figure 4) had a higher concentration of NO_3^-, and tap water from Kumasi and well water from Gomoa had higher concentrations of NO_2^- than standard Japanese tap water. Given that NO_2^- has a bad effect on human health and is apt to be converted to NO_3^- in the environment, the value of 0.1 mg/L should be noted. These results showed that water quality is not managed and maintained carefully in Ghana.

Most of the results for environmental water (Table 2) showed a lower value than the standard values for waste water in Japan. However, stream water in agricultural land in Gomoa and stream water in the university campus in Kumasi had higher concentrations of NO_3^- (14.25 mg/L) and PO_4^{3-} (1.12 mg/L), respectively. It can be concluded that local discharges directly affect water quality. In the case of Gomoa, the stream is located in agricultural land, but this concentration of NO_3^- is a little higher than can be explained as an effect of the fertilizers or chemicals they use. In the case of Kumasi, even though most of the students and teachers live on the campus, this PO_4^{3-} concentration is a little higher than can be explained by the effect of human sewage.

Unexpectedly, puddle water in a damping site (Figure 5) showed normal concentrations, although the COD concentration was high. The sample from Obuasi also showed a high COD concentration. Moreover, the sample from the damping site had a 4 mS/cm reading for EC. These results showed that the low water quality in these areas is caused by human activities: gold-mining or a large amount of garbage.

A higher concentration of SO_4^{2-} was found in samples from Accra and Gomoa. The sulfate ion is not dangerous to health, but there is the possibility of its converting to H_2S, which is toxic in anaerobic situations.

However, this research inevitably included inaccuracies. Regarding the program property and avoiding the over equipment, sampling was done from only one point with no replication in each location. Nevertheless, information on regional water quality was obtained, and this indicated that water quality is not

managed and maintained to a high level in Ghana

From the interview with Mr. Michael Onwona I learned that Ghana has lax criteria for water quality, and that it is difficult to maintain high water quality because they do not have adequate facilities. Regional differences in waste-water treatment systems is another problem. In urban areas, many houses have septic tanks, but in rural areas most sewage flows directly into natural streams. In the gold-mining area, the critical factor for the severe water pollution is the existence of illegal enterprises. The Ghanaian government obliges gold-mining companies to be registered. The registered companies are required to assess the environment before they begin operations, and during and after mining they must report their effects on the environment. However, almost all gold mining is illegally operated, without registration. This is the reason why the government cannot take into account the whole context of pollution and take appropriate countermeasures.

Table 1. The measured concentrations of NO_2^-, NO_3^-, PO_4^{3-}, SO_4^{2-}, COD, and pH in drinking-water

* This value is not the standard but the guideline.

Drinking Water		NO_2^- (mg/l)	NO_3^- (mg/l)	PO_4^{3-} (mg/l)	SO_4^{2-} (mg/l)	COD (mg/L)	pH
Accra	tap	0.1	0.1	0.02	0.1	0	7.5
Kumasi	tap	n.a.	28.2	0.67	27.7	10	7.5
Obuasi	well	n.a.	2.2	0.05	0.7	20	7.0
Gomoa	well	0.1	0.5	n.a.	104.1		5.5
pack water		n.a.	13.9	n.a.	1.6	0	7.5
the standard values of tap water in Japan(1)		less than 0.05mg/l less than 10mg/l			400mg/l*		(5.8–8.6) 7.5

Table 2. The measured concentrations of NO_2^-, NO_3^-, PO_4^{3-}, SO_4^{2-}, COD, pH in environmental water

Environmental Water		NO_2^- (mg/l)	NO_3^- (mg/l)	PO_4^{3-} (mg/l)	SO_4^{2-} (mg/l)	COD (mg/L)	pH
Accra	river in downtown	0.08	0.31	n.a.	25.94	50	
Kumasi	stream in university	n.a.	0.31	1.12	1.05		
Obuasi	stream in mining site	0.08	0.45	n.a.	0.71	>100	6.6
Gomoa	stream in farm land	n.a.	14.25	n.a.	18.22		
LakeBosumtwi		n.a.	0.27	n.a.	0.69	20	9.0
Damping	pound	n.a.	0.51	n.a.	0.67	>100	
the standard values of waste water in Japan(2)		(NH3,NH4+)*0.4 NO2−,NO3− less than 100mg/l		**0.1mg/l** 16mgP/l (Day Average 8mg/L)		160mgP/l (Day Average 120mg/L)	5.8–8.6

Figure 3. Common well in Obuasi

Figure 4. Commercial water pack

Figure 5. Damping site in Acrra

(2) Findings, achievements, significant experiences, and lessons learnt

During the overseas field training in Ghana I faced many difficult questions. At first, I felt I should not adhere to my own hypothesis or measurement skills in the field. I expected that heavy pollution and eutrophication would be occurring by direct inflow of sewage. However, this was not shown in the results of my chemical analysis. In fact, taking into consideration on-site observations − such as smell, color, appearance, location and so on − my conclusion was that "The water is not safe to drink, something is wrong"; for instance, heavy metal pollution or breeding of disease-causing bacteria. However, I could not substantiate this "field-oriented feeling" based on my own limited knowledge and measurement skills. In such a situation, I need to realize the problem is bigger. I need to cooperate with other researchers, because the goal is to figure out the problem. On the other hand, I do think it is important to obtain the basic information and to estimate the effect of environmental phenomena. In this case, I must remember that my analysis was based only on point data, and I cannot conclude that human sewage is not the problem from this data alone.

I feel that it is important to educate people about environmental problems appropriately. When I discussed water pollution issues in Ghana with some of the students, they said that lack of knowledge is the reason people pollute the environment. I realized this problem when I visited a small community in a gold-mining area. Some people recognized the potential risk from the direct inflow of mining waste water or human sewage to the ground, but they said "We feel it is bad but we don't have any way of proving this." I think adequate education and information should be provided as soon as possible.

The last issue relates to Japan's standpoint. When I visited the JICA project site I was impressed by their concept of "Help with simple and adaptive techniques." In agriculture, I think this concept is best because it is the best way to protect the environment. However, I also think cutting-edge technology may be needed in some cases. In the near future in Africa, economic development will occur and infrastructure improvement will be needed. This will involve introducing more scientific technology into agriculture and industry. At that time it will be important to choose the right methods in terms of global environmental issues. For example, if someone wants to own a private car, the car should be the more environmental friendly one. Of course the problem is very difficult because of a shortage of economic and technological potential.

We should help them make the right choice for the environment, while bearing in mind that they face many serious challenges.

During this overseas field training I sometimes heard the saying, “Japanese don’t act when the Japanese government says ‘No’.” I don’t think this is a problem of the Japanese personality. We have learnt that we must think about the utilities and problems of technology from past bitter experience.

Ghana is an economically developed country compared with other countries in Africa, and so I think the environmental problems I saw there will be seen in the future throughout Africa. I would like to keep thinking about global environmental problems from the viewpoint I got in this overseas field training.

In this program in Ghana I appreciated the opportunity to do many kinds of activity. For example, scientific activities (sampling, measurement), a presentation, an interview, visiting the JICA project site, visiting communities, having discussions, and so on. In the FOLENS program I think it is good to include many kinds of activity.

(3) Achievements and future vision

I think that the field-oriented leader in environmental sectors in Asia and Africa should look at problems from many different perspectives, assemble the necessary information and consider all the various factors together. They can then forecast the next problem and suggest ideas for improvement.

I think the role of FOLENS is different from environmental assessment. FOLENS should not only have the viewpoint of science, sociology and economics, but should also take a human perspective. As a result, I don’t think I should rigidly adhere to my own hypothesis or measurement skills in the field. The important thing is to work out the problem that affects people’s health or natural environment.

When we offer opinions as a member of FOLENS, I think we should understand and respect the local traditional ways. It is important to take the local background into account when it is different from one’s own country. In most cases, native people do not think that their behavior has a bad effect on the environment.

As a result of this overseas field training I am able to consider the environmental problems that will be seen in the whole of Africa in the future. This experience was a start to forming my own opinions on what kind of approaches will be needed on a global scale, which was the purpose I gave in my proposal paper.

As a next step, I would like to summarize my knowledge on the situation with regard to water pollution and consider the cause of each type from the viewpoint of science, and with the input of other members. Then I would like to make a prediction for the future and suggest an improvement plan after gathering all the different viewpoints obtained during the field training in Ghana.

At present, I am interested in environmental administration. When I think about the Japanese environment, it is hard not to think about the environmental problems of the whole world. When considering worldwide ecology, I think the environmental provisions in Africa are very important. I would like contribute to improving the environmental problems in Africa in the future.

(4) Acknowledgements

Firstly, I would like to acknowledge the kind support of Professor John Ofosu-Anim, Professor Edward Benjamin Sabi and Professor Samuel Nii Odai.

I learned a great deal in my interview with Mr. Michael Onwona, and I would like to thank him for kindly giving his time to talk to me.

I am also grateful to the many students from the University of Ghana and KNUST for their friendly and sincere discussions and for their kind help. The time with you made me love Ghana.

Ozaki sensei, Ninomiya sensei, and Sagehasi sensei: thank you for arranging this program and for your kind help. Your thoughtful suggestions and encouragement always helped me. Thank you so much. I would also like to acknowledge Professor Watanabe's kind assistance.

Xiao, Rola, Chihiro, Yuta, Yuya, and Yosuke: thank you so much for your generous cooperation. I have fond memories of all of you, and I am glad I shared those precious experiences in Ghana with you.

Finally, I would like to express my appreciation to my supervisors, Professor Yoh Muneoki and Associate Professor Koba Keisuke. Thank you for your understanding and help.

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(Supervised by Muneoki Yoh)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

An environmental investigation in Accra and Kumasi, Ghana: Soil erosion

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Republic of Ghana, 5, Sep.,-18, Sep., 2011

Key words: Ghana, soil erosion, pH, EC

Abstract

From 5 to 18 Sep, I with FOLENS members spent the time in Ghana to investigate the environmental issues. We cooperated with two universities and went to two cities in Ghana-capital Accra and Kumasi. During the days in Ghana, a lot of problems on environmental were shown up, especially the part of soil erosion. The 7 soil samples were taken in 6 places, and then analyzed for physical and chemical properties, such as soil color, soil texture, soil pH value, soil EC value. The color of the most soil surface in Ghana was reddish brown, sand texture. The soil pH value in mining places were around 5.0, little bit acid than the samples around the universities. After the analysis, we showed our data to the Ghanaian students, had a discussion with enthusiasm. We tried to find a better way to prevent and solute the issues in Ghana, we also brought the advices of Japanese and Chinese advanced experiences to them. All the Ghanaian and us want to build a sustainable development environment, a beautiful future.

(1) Activities during the overseas field training

On 5 September 2011 my two weeks of field training in Ghana with FOLENS members began. The purpose of this trip was to understand the environmental problems in Ghana, especially the part played by soil and water, through visiting modern agricultural and gold mining locations, and then developing solutions for soil and water conservation.

Before our departure Professor Siaw Onwona-Agyeman gave us a lecture to introduce the problems and current situation in Ghana. Because of my major in soil science, the problem of soil erosion really impressed me, so I decided to research soil erosion during my oversea training.

During this training we cooperated with two universities: the College of Agriculture and Consumer

Sciences, University of Ghana (UG), and the Department of Civil Engineering, Kwame Nkrumah University of Science and Technology (KNUST). With the help of Professors John Ofosu-Anim and Edward Benjamin Sabi from UG, and Professor Samuel Nii Odai from KNUST, we visited the mines and ventured into the local villages to observe the lifestyles of the Ghanaians.

When we first arrived at UG and KNUST, FOLENS staff introduced Tokyo University of Agriculture and Technology (TUAT) and FOLENS to the Ghanaian students and professors. I contributed some information on the kinds of soil erosion and pollution that had occurred in Japan and China and also ideas about management, prevention, and solutions for pollution. The professors and students of the University of Ghana showed a passionate interest in TUAT and FOLENS and we had an enthusiastic discussion with them. We also received much advice on how we can help and conduct research in Ghana, both during those two weeks and into the future.

The following four days after we arrived at Kumasi city, Professor Odai has a good relationship with the owner of the mine, so we were able to visit it safely. We visited two kinds of mines and observed the surrounding environment. Turbid water in the channel might be polluted with mercury and minerals after the leaching operation. The discharged sediments had already changed the color of water in the river and were heaped into a hill. The workplace was very simple and crude; most of the workers looked young, and there were some primary school students there on summer vacation.

Next to the mine was a community where about 2000 people live. These 2000 people rely on one well, there is no sewerage systems for domestic sewage collection and they are exposed to pollution caused by mining. Soil erosion is everywhere in the village; for instance, the soil of the main road, the soil under the houses, and the surface soil that should have covered the tree roots had already gone.

We also visited the JICA (Japan International Cooperation Agency) office located in Ghana and received information about the JICA rice project, which began in 2009. Then we went to a paddy field, which is a model field under JICA's scientific management of fertilizer, water, cultivation, and harvest. The staffs are trying to make cultivation more scientific in order to create maximum benefit for the farmers. The rice project has been successful and has attracted more than 30% of local farmers to join them and become a "new style farmer". Although this rice project is facing a number of different problems, the JICA staffs still contribute to the improvement of the project, and they believe the number of local farmers who want to join will increase in the future.

When we came back to Accra we visited another village, Gomoa Dahom. This was very different from the community near Kumasi. The village has a strict and impartial leadership. The chief and female chief (Queen Mother), as the leaders of the village, manage the daily work of the whole village systematically. However, the village also has serious soil erosion like the community in Kumasi city.

The experiences and sights in Ghana are so different from Japan and China.

(2) Findings and achievements, significant experiences and lessons learnt

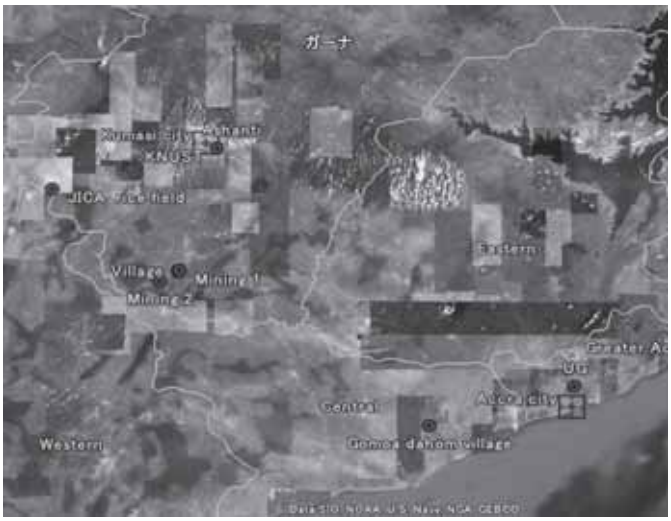

Figure 1 Soil sampling places in Ghana

During the two weeks' field training in Ghana we visited many places: the University of Ghana, Kwame Nkrumah University of Science and Technology, mining sites, communities in Accra city and Kumasi city, and the JICA paddy (as shown in Figure 1). To our surprise, all of these places suffered from soil erosion (Figure 2) while travelling between Accra and Kumasi cities. That is because Ghana is located near the equator, with high temperature all year, and just two main seasons: wet and dry. The rainy season occupies almost half the year, and most of the rain is heavy. This is the main reason for the soil erosion.

The villagers did not do any prevention to their house and land in the rainy season. Soil erosion is happening everywhere and is becoming more serious every year.

In order to understand the soil and its characteristics, seven soil samples were collected in different locations (Table 1 and Figure 3).

Figure 2 Soil erosion in Ghana

After sampling, the physical and chemical characteristics of the soil were analyzed in the laboratory of UG, and the results are shown in Table 1.

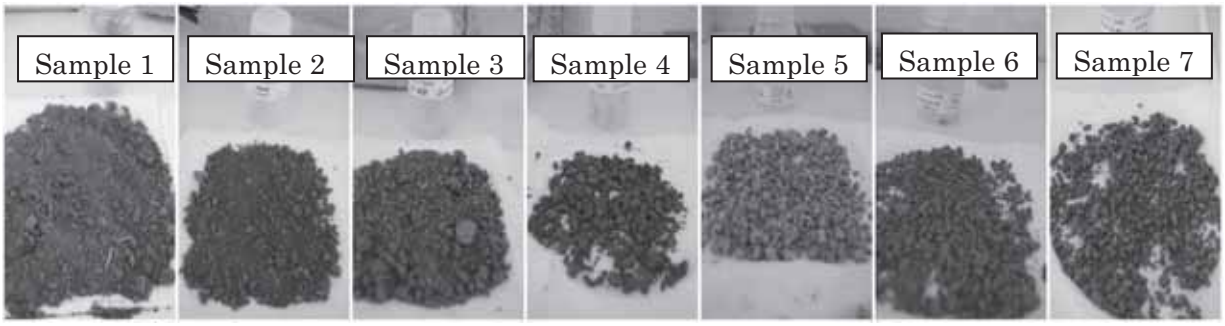

Figure 3 The pretreatment of seven soil samples

Table 1 Physical and chemical characteristic of soil samples

	Location(N/W)	Soil Color	Soil Texture	pH value	EC value (μS/cm)
Sample 1	N:6°8′ 34.00 " W:1°43′ 14.22 "	Dull yellowish brown	Clay loam	4.98	220.00
Sample 2	N:6°8′ 34.00 " W:1°43′ 14.22 "	Yellowish brown	Clay loam	5.15	21.55
Sample 3	N:6°5′ 55.26 " W:1°47′ 52.53 "	Yellow orange	Clay	5.16	8.24
Sample 4	N:6°29′ 28.58 " W:2°13′ 17.43 "	Dull reddish brown	Clay loam	7.67	136.95
Sample 5	N:6°40′ 5.38 " W:1°34′ 32.30 "	Dull reddish brown	Sand	6.09	39.80
Sample 6	N:5°28′ 42.24 " W:0°44′ 52.35 "	Dark brown	Sand	7.78	108.10
Sample 7	N:5°38′ 56.09 " W:0°11′ 0.93 "	Reddish brown	Sand	5.88	37.35

The different colors of the soil samples are clearly visible (Figure 3). Samples 1 and 2 came from the same mining area, but sample 1 was from near the leaching location and sample 2 was from further away. Sample 3 was also from a mining area, but different type of mine from samples 1 and 2; sample 4 came from the JICA rice field; sample 5 was taken at KNUST; sample 6 was from the village in Accra; and the last sample was from UG.

Table 1 shows that samples 1 and 2 have different physical and chemical characteristic, especially the EC value, even though they were both collected from the first mining area. This is because sample 1 was taken from the leaching location and the turbid water may have seeped into the soil surface, changing the soil's characteristics. In contrast, sample 2 was from near the gate, further away from the workplace, so the effect on sample 2 is less serious than for sample 1. Mining activities can change the soil's characteristics.

As a student studying environmental conservation, during this field training I observed (both in

person and by conducting a survey) many issues that were crying out for good management and rules to ameliorate and protect the environment in Ghana. I felt the helplessness of the children, which the pollution should be stopped and solved urgently and also that the education provided to the Ghanaians should be effective and practical.

(3) Achievements and future vision

I gained so much from this field training, not only from the FOLENS staff but also from the professors and students in Ghana. When the training finished I felt that the experience had been very fruitful.

When planning and writing the proposal before the trip, I needed to think through a lot of things very carefully, including the purpose and significance of the trip, and also the schedule and what I should do during the training.

During my time in Ghana I had to deal with the variety of situations that can suddenly occur: communicating and cooperating with people who have a different background and language; finding out the issues in a foreign country; and working out solutions to these problems to help alleviate people's suffering. This training was a good opportunity to practice my ability to approach situations with an open mind.

At the end of the training I wrote up the results, achievements and lessons learnt, and prepared reports and presentations, which will hopefully provide some solutions to help the people recover from their polluted environment. All of these experiences helped to make me more professional.

In the future, if I work as a leader in the environmental sector, I will apply what I learnt from these experiences to my work.

(4) Acknowledgements

This oversea field training was organized and supported by the Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa (FOLENS), and Tokyo University of Agriculture and Technology (TUAT). I would like to thank the College of Agriculture and Consumer Sciences, University of Ghana (UG), Kwame Nkrumah University of Science and Technology (KNUST), and the JICA office for their help and cooperation. I am grateful to Professors John Ofosu-Anim and Edward Benjamin Sabi from UG, Professor Samuel Nii Odai from KNUST, and the students from both universities who accompanied us and worked hard to act as a bridge between us and the villagers.

(Supervised by Hirokazu Ozaki, Sachi Ninomiya-Lim, Masaki Sagehashi; co-supervised by Yuji Koh go, Haruo Tanaka)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

The conditions in a Ghanaian rural area

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Destination and period: Ghana, 9/5/2011~9/18/2011

Key words: rural planning, agriculture, recognition

Abstract

Agriculture is the main industry in Ghana and accounts for about 30% of GDP and 60% of employment. As a result, the development of farm villages is important for Ghana, and appropriate rural planning is required to accomplish this development. I investigated the conditions in a Ghanaian farm village, Gomoa Dahom, and Ghanaian students' knowledge of rural villages using interviews and questionnaire. The main problems identified by the students for Gomoa Dahom were: a drain of young people to the cities, no maintenance of infrastructure (bad roads in particular), no facilities such as toilets and hospitals, erosion, a decrease in rainfall, and lack of a good water supply. Many students identified bad roads, erosion, and climate change, and there was a little difference between the students and the village farmers. I found that to find good partners and support of independence from aid is important and I want to make most use of these findings for the future.

(1) Activities during the overseas field training

Title of my overseas field training: The conditions in a Ghanaian rural area
Names of the partners: YAMAGUCHI CHIHIRO, Mr. Patrick Mireku, Mr. Richard Omari Ansong, and Mr. Richard Morton

Training schedule: 9/12~9/14

Agriculture is the main industry in Ghana and accounts for about 30% of GDP and 60% of employment. The development of farm villages is therefore important for Ghana, and appropriate rural planning is required to accomplish this development.

The aim of rural planning is to solve the problems the villagers have and improve their lives, and so we need to know the challenges the villagers face as a basis for planning.

Because we had little information about Ghanaian rural areas, I investigated the conditions in Gomoa Dahom, a typical farm village, and local students' knowledge of rural villages to get basic information that could contribute to future planning. For the village research I interviewed farmers about rural problems. For the student research I distributed questionnaires about rural problems in Ghana to 43 students at the University of Ghana (UG) and Kwame Nkrumah University of Science & Technology (KNUST). The questionnaires were multiple-choice. I presented the results to the Ghanaian students and their professors.

We also visited the Japanese embassy and heard about Ghana and Africa.

(2) Findings, achievements, significant experiences and lessons learnt

The main problems for Gomoa Dahom identified from the questionnaire were the drain of young people to cities, no maintenance of infrastructure (bad roads in particular), lack of facilities such as toilets and hospitals, erosion, decrease in rainfall, and lack of a good water supply. The outward migration of young people is also a problem for Japanese villages,

but erosion and lack of water supply are not major issues in Japan. Lack of facilities is an issue in rural Japan, but Ghanaian villages have comparatively much fewer facilities.

I also asked what is required to address the issues, and most people emphasized employment in the village and irrigation systems. From this I concluded that the drain of young people and no rainfall are the most serious problems for villagers.

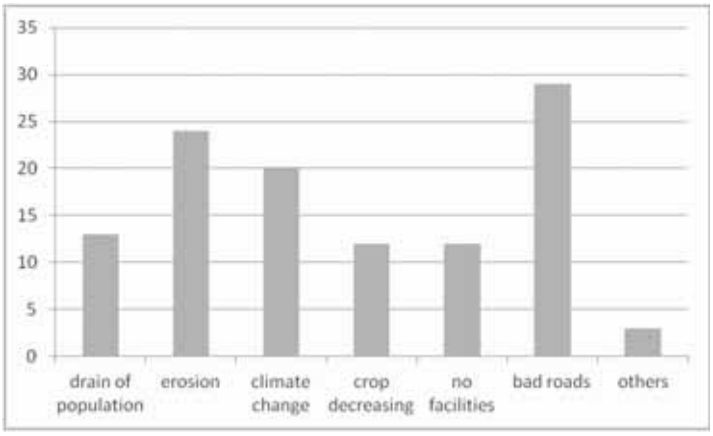

Figure1 Recognition of students

One of the questions in the student questionnaire was, "Do you know of any problems in rural areas?" and the choices were drain of population, erosion, climate change, decreasing of crops, no facilities such as toilets and hospitals, bad roads and others.

Figure 1 shows the results. Many students recognized bad roads, erosion and climate change and students who recognized population drain were not many. As already mentioned, villagers regarded population drain as the most serious problem, so there was little difference between villagers and students on this point.

(3) Achievements and future vision

The main findings from the research were: 1) villagers want to keep young people in the village and to establish an irrigation system, 2) there was a little gap between the perceptions of the villagers and the

students on rural challenges.

In this field training I learnt some important things, which I can apply to my future research and international cooperative activities.

First, it is important to find good partners who are well acquainted with the area one wants to research. If it had not been for the kind help of the Ghanaian professors and students, we could not have done anything. It was a good opportunity to find out that eagerness alone is not sufficient to conduct research in an unknown area.

Second, is the support to be independent from hospitable aid is also necessary at times. We had the opportunity to visit one Japanese embassy during our training, and I learnt from him that too much aid can hinder the development of African countries. Environmental leaders are also required in order to bring out the power of local people.

In the future, when I enter an unknown area for research or to provide support, these experiences will help me.

(4) Acknowledgements

In this field training I was helped by many people. I would like to thank Prof. John and Prof. Odai for their kind help. I would also like to thank the students of UG and KNUST for their kind support. Finally, I wish to thanks the FOLENS staff for giving me this valuable opportunity and for providing companions on this trip.

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・HP of Ministry of Foreign Affairs of Japan http://www.mofa.go.jp/mofaj/area/ghana/data.html

(Supervised by OZAKI Hirokazu, NINOMIYA-LIM Sachi, SAGEHASHI Masaki; co-supervised by NAKAJIMA Masahiro)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Energy consumption and awareness of energy problems in Ghana

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Master 1st, Applied Chemistry, Graduate School of Engineering in TUAT
Report of visit to University of Ghana, Republic of Ghana, 5–18 September 2011

Key words: depletion of fossil fuel, global warming

Abstract

Global warming and the depletion of fossil fuels are worldwide concerns. The Kyoto Protocol and the reduction of greenhouse gas emissions are crucial to reducing these problems. Emission reductions are important not only in advanced nations, but also in developing countries, whose cooperation is indispensable. To investigate energy consumption and public concern about environmental problems in a developing country, I visited Ghana. Through questionnaires I surveyed energy use in daily life and in agriculture. I found that Ghanaians have a high level of environmental awareness in spite of little energy consumption. This result is encouraging for the introduction of green technologies in developing countries. The knowledge gained through this visit will inform the development of sustainable energy in developing countries. I would like to develop the technology which suit the country with the knowledge I got through this training as chemical engineer.

(1) Activities during field training in Ghana

Title: Energy consumption and awareness of energy problems in Ghana
Counterparts: Prof. John, University of Ghana
Prof. Samuel Nii Odai, Kwame Nkrumah University of Science and Technology (KNUST)
Program:
9/6 Arrive in Accra
9/7 Introductions
Briefing about nature, society, and environment of Ghana by John sensei
Tour campus of University of Ghana. Visit dumping site

9/8 Visit Kumasi
Lecture about energy and gold mining in Ghana by Odai sensei
Visit energy center
9/9 Visit gold mining site; sampling and interviews
9/10 Visit JICA project; interview farmers and students of KNUST
9/11 Return to Accra
9/12 Visit Gomoa village; interviews and sampling
9/13 Questionnaire; interview students of University of Ghana and residents of Accra
9/14 Ditto
9/15 Visit botanical garden
9/16 Closing session

Background and aim

The two major industries in Ghana are agriculture and gold mining. In the past 20 years, mining has increased rapidly, and environmental pollution has spread. For example, mercury was detected at 5 times the EPA standard, which is applied in Ghana, and at 26 times the WHO standard in oranges grown in Obuasi, a typical gold mining area. Agriculture accounts for 56% of the population, but the industry is small scale: 60% of farmers have 1.2 ha or less of farmland.

Energy in Ghana is derived from biomass (65%), petroleum products (20%), and hydro-power (15%). Firewood and charcoal for cooking in rural areas explain the high proportion of biomass. On the other hand Butane and charcoal are used for cooking in urban areas. Electricity is generated from hydro-power (55%), lightweight crude oil (36%), and natural gas (9%). Lake Volta is the main source of hydro-power. Sources of clean energy such as atomic, wind, and solar are not available.

Global warming and the depletion of fossil fuels are worldwide concerns. The Kyoto Protocol and the reduction of greenhouse gas emissions are crucial to reducing these problems. In the Kyoto Protocol, Emission trading and CDM is available. So emission reductions are important not only in advanced nations, but also in developing countries, whose cooperation is indispensable.

In Ghana, I investigated energy use in daily life and people's interest in energy problems. The answers will inform the development of sustainable energy sources for Ghana.

And, I studied the method of water and soil sampling by going together with the student who major in other scientific fields. I think these experiences will be helpful to the future. Because clean energy is closely related to environmental problems, and we don't have to disregard the influence on the environment by introducing clean energy.

(2) Findings, achievements, experiences, and lessons

To investigate energy consumption and the awareness of environmental problems in Ghana, I interviewed students of the University of Ghana and KNUST and residents of Accra city and Gomoa village about their concern about environmental problems. I posed the following questions:

“Are you concerned about global warming?”

“Are you concerned about the depletion of fossil fuels?”

If “yes”, I then asked:

“Would you forgo part of your income if it could be used to solve energy problems?”

“Would you pay more tax if it were used to solve energy problems?”

“Should the government solve the energy problems?”

In addition, I investigated energy use in agriculture in a JICA project and in Gomoa village. And I investigated energy use in daily life in Gomoa village and accra.

Most students were interested in energy problems and would pay for a solution. In contrast, only 22% to 33% of non-students were interested, though 33% of those would pay more in tax to solve the problems (Figs. 1–3). All believed that the government should solve the energy problems (Fig. 4).

In villages, families use about 16 kg of firewood per day for cooking, and about 450 Wh of electricity.[3)] These quantities equate to 1/18 of the energy usage for cooking and 1/22 of the electricity usage in Japan.[1,2,4)] In Accra, families use 0.4 kg of gas and 0.2 kg of charcoal per day for cooking and about 2000 Wh of electricity.[1,2,4,5)] These quantities equate to 1/50 and 1/5 of the usage in Japan.[1,2,4)] The greater efficiency of gas and charcoal (which are generally unavailable in rural areas) and the availability of food outlets in Accra explain the greater energy consumption in the villages.

Since the small field size in Ghana precludes the use of machinery, energy consumption by farm machinery is nil.

Ghanaians have a high level of environmental awareness in spite of little energy consumption. This result is encouraging for the introduction of green technologies in developing countries. The knowledge gained through this visit will inform the development of sustainable energy in developing countries. In that case, I think that it is necessary to also develop developing countries-oriented alternative energy. I would like to develop the technology which suit the country with the knowledge I got through this training.

With good sunlight, Ghana is a suitable region for solar power generation. Frequent blackouts make solar electricity an attractive proposition. Solar panels are easy to maintain at the level of the individual home. But they are very expensive and so won’t be useful unless they can be made much more cheaply.

Helping other students collect water and soil samples gave me experience outside my field. Such cross-discipline learning is a valuable experience that should be incorporated into study trips.

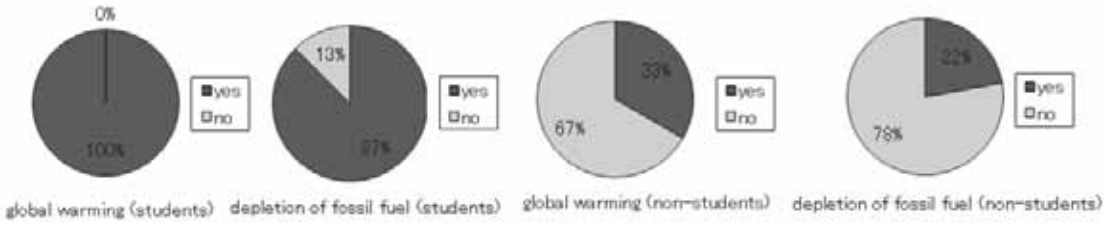

Fig. 1 Are you concerned about global warming or the depletion of fossil fuels?

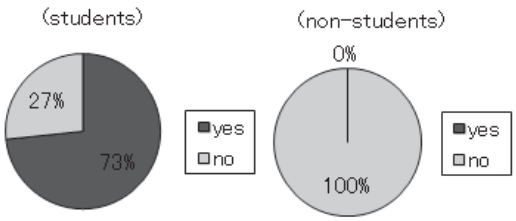

Fig. 2 Would you forgo part of your income if it could be used to solve energy problems?

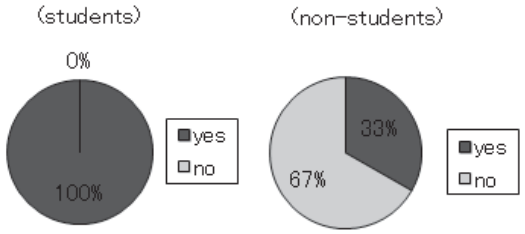

Fig. 3 Would you pay more tax if it were used to solve energy problems?

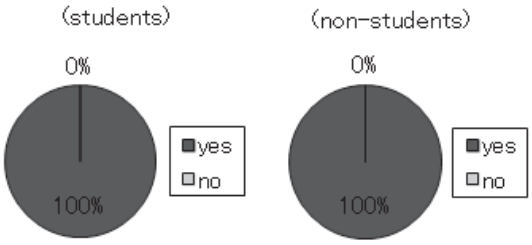

Fig. 4 Should the government solve the energy problems?

(3) Achievements and future vision

I learned about the energy situation of Ghana in this overseas field training. The Ghanaian people I interviewed are concerned about sustainable energy. Moreover, in Ghana, natural gas is used in urban areas and the biomass is mainly used in rural areas. Rapid economic growth in Ghana will drive increases the population in urban area. And it will drive increases in the use of fossil fuels, such as natural gas. Yet poor roads (there are many holes on loads), frequent electricity blackouts (for as long as 2 days in some rural areas), and lack of access to electricity by 40% of families attest to the need for the development of sustainable energy sources that are easily maintained and locally operated. The high awareness of energy problems in Ghana will ease the introduction of sustainable energy there.

Because global warming and the depletion of fossil fuels pose real problems for the world, sustainable energy will grow in importance. Overseas experience such as mine is useful for the development of sustainable energy, not only for the domestic market, but also for developing countries such as Ghana.

The role of environmental engineering in developing countries will expand with the need to solve energy problems and to institute clean development mechanisms. Experiences such as mine will aid in the development of developing countries.

(4) Acknowledgements

I give my heartfelt thanks to Ozaki-sensei, who arranged this visit. Special thanks also go to

Sagehashi-sensei and Niomiya-sensei, who traveled with me. I also thank Associate Professors John, Edward and Odai, who hosted our visit to Ghana.

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(Supervised by FOLENS staff, Assoc. Prof. Watanabe. Co-supervised by Assoc. Prof. Qian.)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Microbial assessment of water resources in rural areas of Ghana

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United Graduate School of Agriculture Science, Tokyo University of Agriculture and Technology Collage of Agriculture, Ibaraki University, Japan
Destination and period: Republic of Ghana, September 5–19, 2011

Key words: water, pollution, coliform, *E. coli*

Groundwater of Suhynso village in Obuasi

Location: Ghana
Date: September 5–19, 2011.
<Report by Rola Mahmoud>

Water is one of life's essential resources, so we attempt to control the chemical and biological properties of water resources. In this report, we focus on the microbial assessment of water resources in the Republic of Ghana, with the total amounts of coliforms and *Escherichia coli* used as indicators of water contamination. Water samples were collected from the areas of Accra, Kumasi, and Obuasi, from different sources of drinking water. Samples of groundwater, water from Bosomtwe Lake, river water, water buckets sold in stores, tap water from the campus of the University of Ghana, and one sample from the sewage plant in Kwame Nkrumah University of Science and Technology (KNUST) were taken, and the efficiency of the sewage treatment plant was evaluated. The results showed that the groundwater in the tested areas was much

cleaner than that from any other water sources in Ghana, making it the most suitable for direct consumption without any treatment. The other water sources showed high contamination with coliforms. The river and Bosomtwe Lake need rehabilitation, and the Ghanaian government should initiate a plan for treating river and lake water. Furthermore, the sewage-water problem needs to be solved, as no infrastructure for the treatment of sewage water has been established, and in addition, there is no system for the treatment of sewage water before it is dumped into rivers.

On September 5, 2011, we started the overseas field training course in Ghana. The program was prepared to cover environmental issues like water resources, gold mining, and energy provision in Ghana. The counterparts from the Republic of Ghana were Prof. John Ofosu-Anim and Prof. Edward Benjamin Sabi from the University of Ghana, and Prof. Samuel Nii Odai from KNUST. The staff from Tokyo University of Agriculture and Technology were Prof. Watanabe Izumi, Prof. Assistant Ozaki Hirokazu, Prof. Assistant Sagehashi Masaki, and Prof. Assistant Ninomiya-Lim Sachi.

Gold mining in Ghana provides thousands of residents with employment, and makes important contributions to foreign exchange earnings, but on other hand, it causes many environmental problems in addition to the land degradation due to industrial intensification. Gold mining is not the only cause of environmental problems in Ghana; untreated sewage and waste also play an important role in the contamination of soil and water.

As these issues have a direct effect on the Ghanaian daily life, health, economy, society, and environment, in our overseas training course we tried to cover the following issues:

1- Chemical and biological properties of water in Ghana
2- The effect of gold mining on the safety of soil, water, and agricultural production
3- Energy
4- Agriculture
5- Culture

In this study, we attempted to evaluate the drinking water in Ghana from a biological perspective.

To assess the biological conditions of drinking water resources, we chose to detect and count the total amounts of coliforms and *Escherichia coli*; the amount of total coliforms is used to assess sewage-treatment methods, so their presence in filtered or disinfected water reveals inadequate treatment. On the other hand, the presence *of E. coli* was also investigated; this is of fecal origin and is present in fresh feces, so the presence of *E. coli* in water indicates fecal contamination.

For the assessment of drinking water, water samples were collected from Accra, Kumasi, and Gomoa Obuasi areas. The water sources evaluated were groundwater, water from Bosomtwe Lake, river water, and water buckets sold in stores. We also collected water samples from the sewage treatment plant in KNUST, which was stopped because of technical problems and overloading. In addition, we took water samples from the river where the treatment plant discharged the water; the samples were taken upstream and downstream of the treatment plant. Then, the presence of coliforms and *E. coli* was detected using Petrifilm™ plates. The procedure used was as follows:

- 1 mL sample was dispensed (using a pipette) on a Petrifilm™ plate
- a spreader was applied across the overlay film to spread the sample across the plate

- the Petrifilm^{TM} plate was incubated at 35°C for 24 h
- the colony-forming units on the Petrifilm^{TM} plate were counted.

During the experiment, we faced cuts in the electricity supply, which made the incubation conditions unstable. However, we were able to overcome this problem, as we intended to use Petrifilm^{TM} plates with which body temperature could be used for incubation.

Coliforms and *E. coli* could not be detected in any of the groundwater samples except those from Gomoa Dahom village, in which the total coliform amount was found to be 12.3 cfu/mL. However, this water is still considered to be safe. On the other hand, Gomoa village groundwater showed less total coliform in comparison with water from a nearby river, in which the total coliform amount was found to be 60000 cfu/mL. However, *E. coli* was detected in groundwater but not in river water, which leads to the assumption that sewage water reached the groundwater.

Bosomtwe Lake and the river water from all communities showed very high amounts of total coliforms and *E. coli* (Figure 1and Table 1). Low coliform populations were detected in the water buckets, but this water is still suitable for human consumption. Moreover, tap water from the Ghana University (GU) campus did not show any presence of coliforms or *E. coli.*

Figure 1 Total number of coliform colonies in water samples.

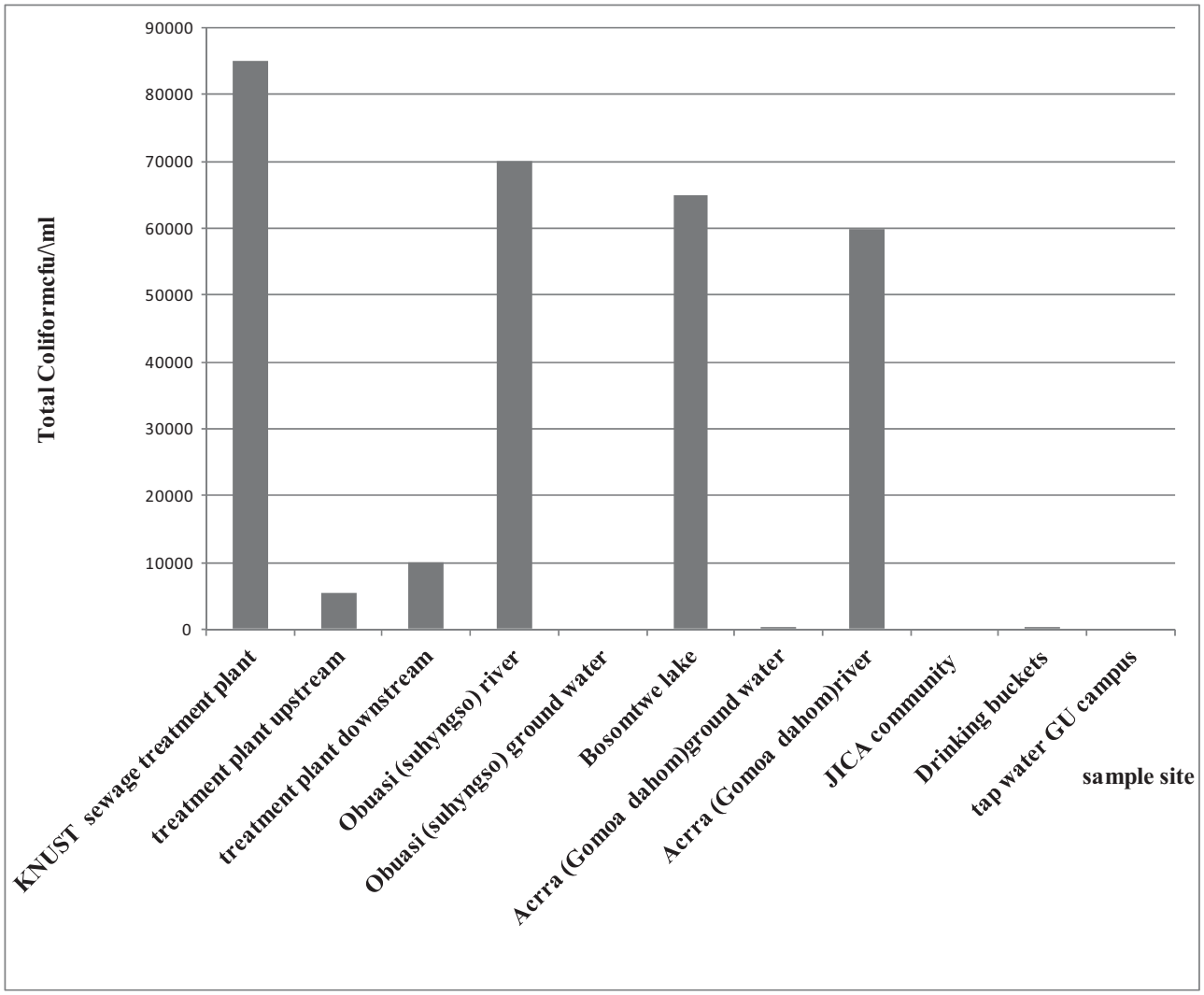

Table 1. Number of *E. coli* colonies in 1-mL water samples:

site	Number of *E. coli* colonies
1. KNUST sewage-treatment plant	0
2. Treatment plant upstream	250
3. Treatment plant downstream	300
4. Obuasi (Suhyngso) River	0
5. Obuasi (Suhyngso) ground water	0
6. Bosomtwe Lake	65000
7. Acrra (Gomoa Dahom) groundwater	2.6
8. Acrra (Gomoa Dahom) River	0
9. JICA community	0
10. Drinking buckets	0
11. Tap water from GU campus	0

Achievements:

From our results, we suggest that the groundwater in the tested communities is much cleaner and safer for human consumption than river water and water from Bosomtwe Lake, which was found to be contaminated and not suitable for drinking.

The river and Bosomtwe lake need rehabilitation to bring them back to life. To achieve this goal, the Ghanaian government should initiate a plan for treating river and lake water. Furthermore, the sewage-water problem needs to be solved, as no infrastructure for sewage-water treatment has been established either in big cities like Accra or in small villages. In addition, there is no system for treating sewage water before it is dumped directly into rivers.

On the other hand, the responsibility for finding solutions to these problems does not lie only with the government, but cooperation is needed between local communities, research bodies, and the government.

It is not easy to solve environmental problems, so commitment is needed to create a better future for the country and for new generations.

I would now like to focus on one of the activities, in which discussions were open between us and the GU students. I found this activity very interesting, and I would like to make a few comments about it.

In fact, the new generation is well aware of the environmental problems surrounding them, and regarding my study, they were interested in whether the water they buy from stores is really clean, and why we always have the idea that what is inside a plastic bottle is much cleaner than what we have in our homes for free. I believe that this is because of good advertisements by water companies, which constantly tell us that their bottled water is much cleaner and healthier.

On other hand, I notice that they put all the responsibility on the government, and have no vision of how the local society could bear part of this responsibility and help to find solutions, depending on their

abilities.

In my opinion, this generation needs help to see the potential in themselves and their communities to be able to change their reality for the best. They see gold as very precious and the main source for the development of their country, economy, and society. However, the reality is that human beings are the source of development.

During our visit, we tried to cover many aspects and many issues that are often unrelated, and this made us less effective.

Therefore, I suggest that in future, FOLEN should focus on one environmental problem during the visit, and try to study it from different perspectives.

For example, the environmental impact of gold mining in Ghana and related activities covers:

Social part: the age of the workers, their education, income, families, etc.

Energy: their consumption of fuel, the energy sources used for cooking or heating in the winter during their stay in the location, etc.

Water: water pollution, drinking water status in the location, etc.

Food: gold-mining influence on food safety, etc.

Future vision

I hope that the results we achieved will be useful for Ghanaians, and will help them to understand how serious the environmental problems they are facing are, so that they can start to take effective actions to solve these problems before they occur.

During my visit to Ghana, I tried to learn how an environmental problem can be addressed, but it is much more important to find solutions for such problems.

How can an environmental problem be solved? We need not only a lot of money, but also suitable technology and a commitment from the government and local residents.

I always felt that I would be able to help more in solving environmental issues if I had more knowledge. However, after my visit, I realized that I need not only knowledge, but also a commitment toward the issue I want to solve, and I hope that in the future I will be able to develop this.

Acknowledgement

I would like to thank Prof. John and Edward from the University of Ghana and Prof. Odai from KNUST for their cooperation and precious time.

I would like also to thank our teaching staff from Tokyo University of Agriculture and Technology (TUAT) for their efforts and their good organization, and all my friends who joined me in this trip and helped me a lot, and from whom I learnt many things.

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(Supervised by Ozaki Hirokazu, Sagehashi Masaki, Ninomiya-Lim Sachi, and Watanabe Izumi.; co-supervised by Narisawa Kazuhiko)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Developing a monitoring station for runoff in northern catchment of Vietnam

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Destination and period: Vietnam Forestry University, Sept. 5 – Sept. 10, 2011

Key words: monitoring station, runoff, northern catchment of Vietnam

Abstract

To understand the hydrological processes at the catchment scale in northern Vietnam, we installed a monitoring station to measure runoff and precipitation in a 1.6 ha mountainous forested catchment at Luot mountain owned by Vietnam Forestry University, Hanoi. Monitoring was conducted from September 8 to October 9, 2011. Based on hydrographical analysis and separation, we found a mean storm runoff coefficient (storm runoff divided by storm precipitation) of 58.5%. Of this, base flow contributed 56.3% and overland flow 43.7%. Peak flow responses to precipitation depended on 2-day antecedent precipitation index (API_2) (e.g., previous dry period) and storm size. The monitoring station will continue to be used for research and training by Vietnam Forestry University. The data we obtained will contribute significantly towards decisions on water resource management. The monitoring station, with instrumentation from Japan, is the first to be installed successfully in Vietnam. As a result of this success, monitoring stations for measuring runoff can be developed in catchments throughout Vietnam to obtain data as a basis for improving sustainable environmental management in Vietnam. This will also make a significant contribution to training engineers in environmental and natural resource management, and will make the University a leader in this field in Vietnam and throughout Asia.

(1) Activities during the overseas field training

To gain practical experience in environmental issues, I selected the overseas field training in the FOLENS program. Luot mountain owned by Vietnam Forestry University, Vietnam, under the guidance of Professor Takashi Gomi and Dr. Phung Van Khoa (a lecturer at Vietnam Forestry University) from September 5 to October 9, 2011. The topic I chose was "Developing a monitoring station for runoff in northern catchment of Vietnam."

Water is the most vital of all the natural resources, and it is essential for people, ecology, and economic development in both forested and non-forested areas. However, the availability and quality of fresh water in many regions of Vietnam are increasingly endangered by overuse, misuse, pollution, and (especially) changing land cover caused by shifting cultivation, which increases deforestation. Water catchment areas that sustain life by providing food and water for communities, and that contribute substantially to the economy and provide the foundation for a rich and diverse natural environment, are also facing enormous and ongoing threats from human activities, thus reducing the quality of life over the coming decades (Ngah and Othman, 2010). For example, natural events such as flash flood, mud flow, debris flow, and landslide frequently occur in mountainous areas (Marzocchi et al., 2009). Soil loss by erosion is also becoming an increasingly severe problem, given that 75% of land in Vietnam is classified as upland (Fox et al., 2000).

The problems of controlling water quality and quantity, along with managing freshwater fisheries, have also become more complex (Valentin et at., 2008). The effects on the hydrological environment will significantly increase if no efforts are made to minimize the potential impacts. Sustainable management of water catchments is one of the options that have to be considered to ensure all development activities have an acceptable impact on both water yield and water quality. However, the lack of scientific information on catchment runoff is hindering the development of solutions and policies in environmental protection and the mitigation of natural hazards in Vietnam. Therefore, to tackle these environmental issues, field-oriented observation is necessary. In this context, developing a monitoring station for catchment runoff in northern Vietnam can play an important role in supporting science based on data, and in guiding the management of water quality and availability to support sustainable development in Vietnam.

Understanding hydrological processes at the catchment scale can be complex due to variability in land use, soil type, climate, and vegetative cover. This field trip therefore concentrated on choosing a study site, installing instruments, and monitoring runoff and precipitation in a mountainous forested catchment in northern Vietnam. Data from previous studies in southeastern Asia was also reviewed to evaluate the effect of physical characteristics on catchment runoff and to help select adequate instruments for the study site.

This field trip was conducted in a small catchment at Luot Mountain, located in Xuanmai (20^{o}58' N, 105^{o}05' E), Hanoi, Vietnam (Figure 1). The area of the catchment is 1.6 ha, and the altitude ranged from 5 to 140 m. Mean annual precipitation is 2268.4 mm. Mean annual temperature and relative humidity are 22.7^{o}C and 82%, respectively (Kim Boi meteorological station). The catchment is covered mainly by acacia, pine, eucalyptus, and some native tree plantation. Instruments for the monitoring station (brought from Japan) were a Parshall flume, a capacitance water-stage data logger, and two tipping-bucket rain gauges, which

were adapted to the conditions in Vietnam. Installation and testing of the instruments was conducted from September 6 to September 8. The monitoring of runoff and precipitation began on September 8 and finished on October 10.

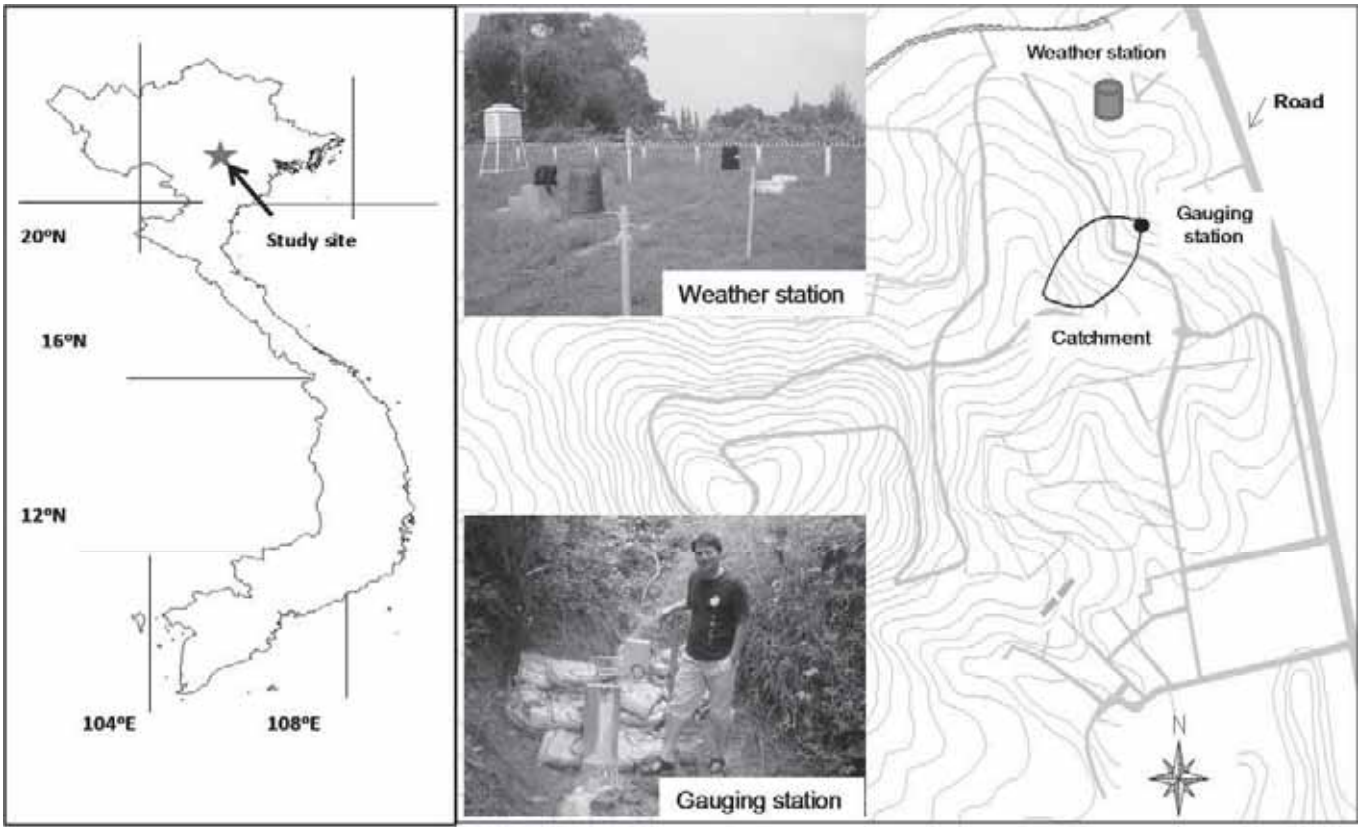

Figure 1. (a) The location of the study site; (b) location and topographical characteristics of the study catchment

(2) **Findings, achievements, significant experiences, and lessons learnt**

2.1. Overview of previous studies in southeastern Asia

The results from previous studies in Vietnam and other countries in southeastern Asia showed a large difference in annual runoff coefficients (calculated by dividing annual runoff by precipitation) among countries and different regions within countries (Figure 2). The biggest mean annual runoff coefficient was found in Vietnam (27.4%), while the smallest was found in Indonesia (2.1%). However, within a country, the annual runoff coefficient was very different across regions. The mean annual runoff coefficients in Laos and the Philippines were 13.3 and 7.6%, respectively.

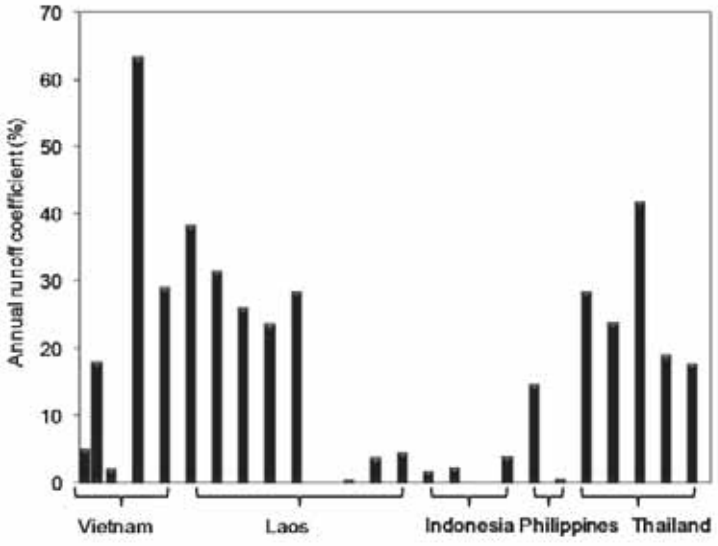

Figure 2. Summarized results of annual runoff coefficients in previous studies on southeastern Asia

Potential reasons for these differences are differences in catchment scale, annual precipitation, and/or land use type. These findings suggested that the study site for our field trip studying water resource management in Vietnam had to be established in Vietnam itself because of the wide variety of runoff coefficients across regions.

2.2. Runoff response to precipitation in a mountainous catchment of Vietnam

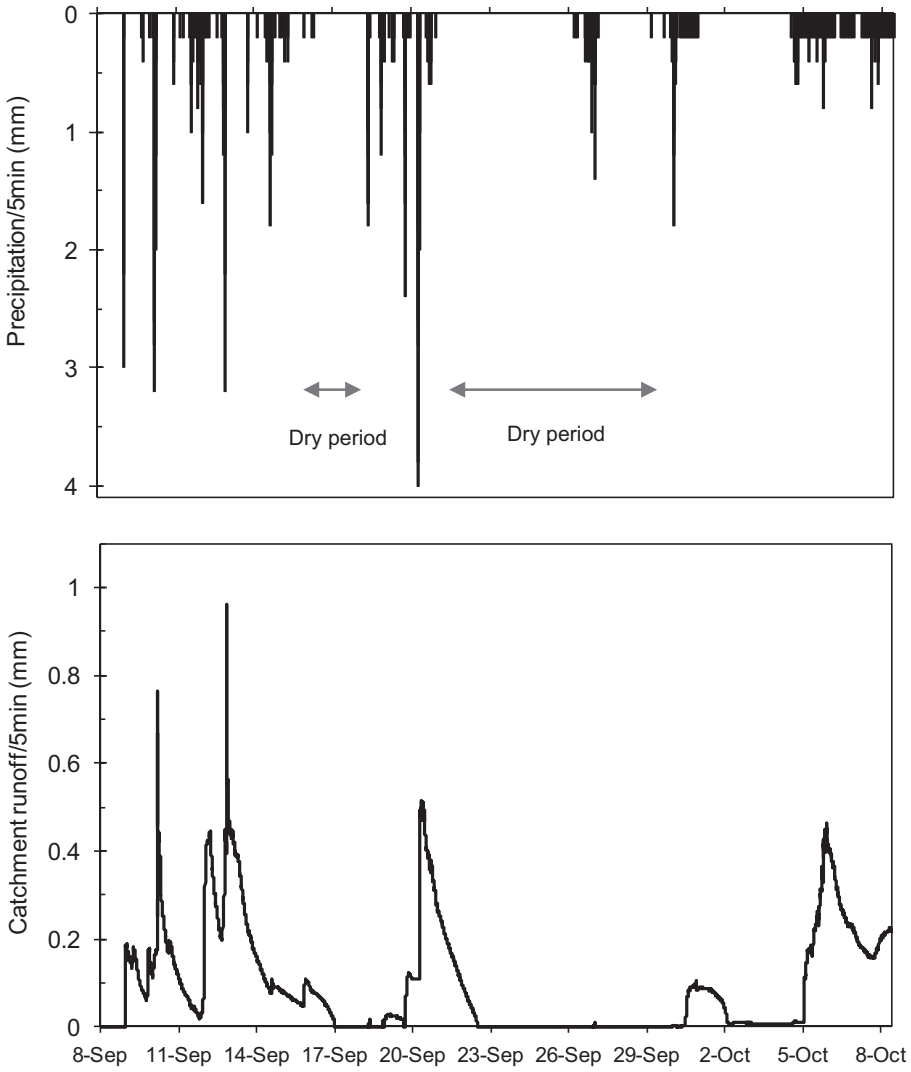

Figure 3. Runoff response to precipitation during monitoring period in forested catchment of northern Vietnam

Catchment runoff quickly responded to precipitation inputs. Increased rainfall intensity corresponded to increased runoff at catchments (Figure 3). Peak runoff appeared at the peak of precipitation, and runoff declined after rainfall ceased without any secondary peaks during this recession. However, peak flow tended to be larger when 2-day antecedent precipitation index (API_2) and storm size was greater and vice versus (Figure 4). In the other words, soil moisture condition is drier; peak flow is smaller because runoff generation is prior infiltrated into soil matrix than overland flow (Figures 3; 4).

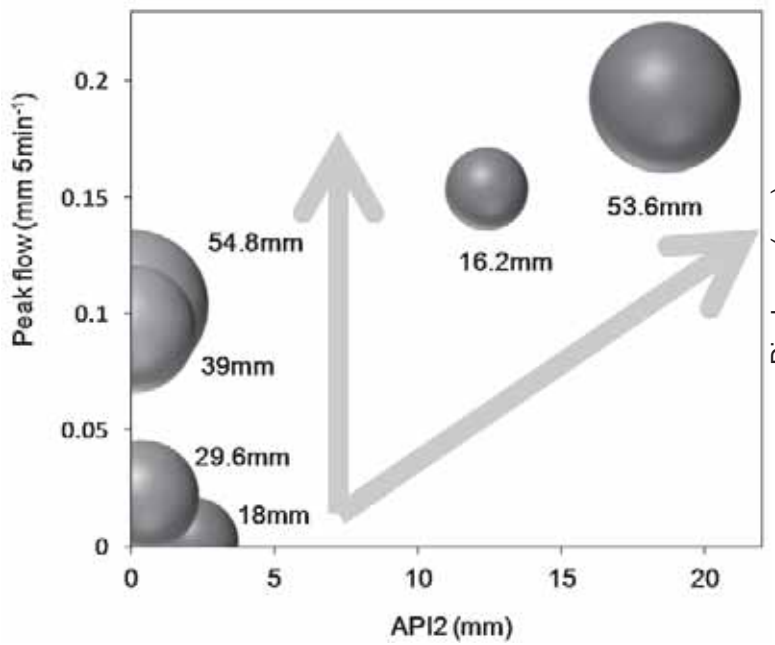

Figure 4. The relationship between peak flow and 2-day antecedent precipitation index (API_2). Circle sizes indicate size of precipitation.

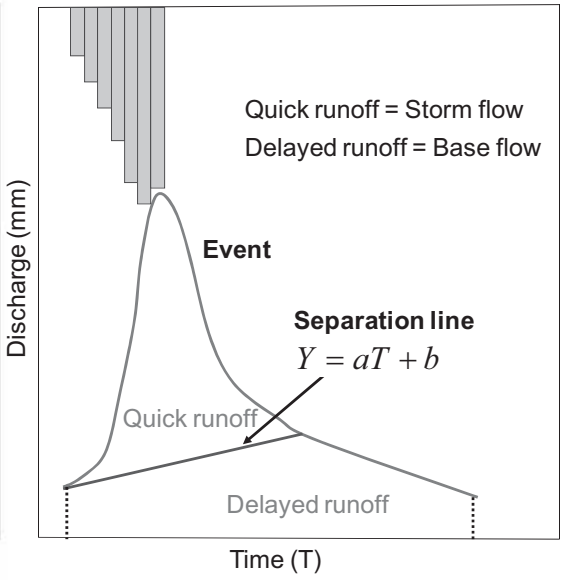

Figure 5. Schematic illustration of hydrograph

Based on hydrographic analysis and hydrographic separation analysis for four storm events (Figure 5), we found that mean storm precipitation was 39 mm per storm. Mean storm flow was 22.8 mm, corresponding to 58.5% of the runoff coefficient (the storm runoff coefficient was determined by dividing storm flow by storm precipitation), in which base flow comprised 12.9 mm (corresponding to 56.3% of storm flow) and overland flow comprised 10 mm (corresponding to 43.7% of storm flow). (Overland flow was defined as that part of the runoff that enters streams during and immediately after precipitation via overland flow and fast subsurface flow. Base flow was defined as slow soil water movement and bedrock outflow.) These separate runoff components enabled a qualitative evaluation of underlying dominant runoff pathways. This suggested that base flow is the dominant hydrological process in the forested catchment at Luot Mountain owned by Vietnam Forestry University, Hanoi.

2.3. Significant experiences and lessons

Besides the significant scientific findings, the overseas field training provided a wealth of experience and lessons through meeting people, both when working in groups and in outside activities. One of the most significant experiences was the selection and adaptation of monitoring instruments from Japan to other countries, especially Vietnam. All of the tasks and operating procedures, including selection, construction, and installation of the station for a specific location of Vietnam, were discussed with my supervisor (Dr. Takashi Gomi) and lecturers from VFU (Dr. Khoa, Mr. Truong, Mr. Hiep, Mr. Le) to devise the best solutions. These activities helped to improve my knowledge, skill, and experience in selecting, installing, and using a monitoring station for runoff and precipitation. Moreover, through group discussion with people from different academic disciplines, I was able to gain a greater insight and understanding of various aspects of the environment and observation conditions at Luot mountain belong to Vietnam Forestry University, Hanoi.

The most significant lesson was how to install a monitoring station for runoff and precipitation successfully; the most important issue was the detailed preparation required in order to set up instruments when coming to a new location, with specific natural and social conditions. Furthermore, the participation of managers, lecturers, and students in equipment installation, use, and protection determined the success of the field trip. As a result of this field trip I know that various aspects of the local environment will be better understood. We (especially, Dr. Takashi Gomi) helped young lecturers of VFU to answer the difficult question that how to get (method) and what can help to get information automatically on runoff and precipitation (Instruments).

(3) Achievements and future vision

Because this experiment was conducted at a mountainous location belong to Vietnam Forestry University, where I will be returning to work and research as a leader in environmental science and resource management after finishing my PhD study, the experience I gained will contribute significantly to my future career. This was a good opportunity to apply the skills and knowledge I am learning in Japan to Vietnam in its present condition. In future, monitoring stations for runoff can be developed in any catchment in Vietnam, in any landscape, to obtain basic data and scientific findings to support sustainable environmental management in Vietnam. This work will also contribute significantly to the training of engineers in environmental and natural resource management, helping to make the University a leader in the field in Vietnam and throughout Asia.

The activities we carried out also helped to improve the skills and knowledge of the researchers, young teachers, and students from Vietnam Forestry University who participated directly in developing the station for monitoring runoff and in applying the techniques. The data obtained will be a great help for teaching and studying at Vietnam Forestry University, both now and in the future.

(4) Acknowledgements

I would like to express my sincere gratitude to Prof. Gomi and Dr. Khoa for providing continuous encouragement and enthusiastic support during the fieldwork in Vietnam. I greatly appreciated the help provided for the field and laboratory work at Vietnam Forestry University, and would especially like to thank Mr. Truong, Mr. Hiep, Mr. Le, and Ms. Duong for their support of the fieldwork. My sincere thanks go to the FOLENS staff (Drs. Furuichi, Ninomiya, Sagehashi, and Ozaki), who gave me the opportunity to go on this overseas field training. In particular, I want to acknowledge Dr. Ozaki for his careful revision and significant comments on the report.

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Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Environmental impacts of livestock activity and mitigation options: a case study of Umbeluzi region, Maputo province, southern Mozambique.

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International Environmental and Agricultural Science
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Destination and period: Mozambique 2011 Sept, 7th, to Oct-1st

Key words: Boane, grassland, fire, soil, vegetation, sampling.

Abstract

Natural grasslands' is a key factor for nutrient cycle and the energy flow in the ecosystem. It is cheap as feed for cattle and high productivity can be reached with good management practices. Natural grassland can store carbon (C), and approximately 34% of the global C stock of in terrestrial ecosystems is estimated to be in soil of natural Grassland. In attempt to increase land productivity farmers use sometimes techniques that are harmful to the environment such as; overgrazing, grassland burning, and absence of beneficial management techniques such as fallow, rotational grazing and rest contribute to the degradation of grassland and consequent reduction of productivity. Those improper techniques has an impact on the environment: by exceeding stocking rate, overgrazing can occur that leads to erosion and desertification, also exceeding stocking rate can cause soil compaction due to cattle trampling. Grazing lower than stocking rate leads to shrubs invasion, and to control shrubs invasion and promote regrowth of grasses, local farmers in Mozambique burns the grassland. These leads to progressive lost of soil fertility, soil acidification and soil erosion.

The study objective was to determine changes on soil and vegetation of grazing grassland due to different management techniques used by farmers in Umbeluzi region, Maputo province, southern Mozambique.

(1) Introduction about the research area

With a population about 24 million people, Mozambique is a country located in southeastern Africa, between 10º 27' and 26º 52' south latitude and 30º 12 and 40º 51 east longitude. Most of the country is

tropical, Mozambique has a total area of about 784,000 square kilometers, and the capital city is Maputo. Mozambique is a large and complex country emerging from 16 years of brutal civil war and 500 years of colonization from Portugal.

Boane (Fig. 1) is a district of Maputo province, the total population in Boane district is 81.406, total area is 815 km^2, inhabitants density is 101people/ km^2 (INE, 2007). The population and urbanization are rapidly increasing because of the following reasons: there are good access by roads and train, the land and water is available in Boane and because Boane is near important market such as Maputo city (Fig. 2) Mozambique capital 30 Km from Boane, 40 Km Swaziland and 60 Km near South Africa from Boane.

(Fig.1) Maputo province Map

(Fig.2) Maputo city at nightfall

Maize is the most important agricultural crop and the additionally, cassava, sweet potatoes, beans, vegetables (Fig, 3) are cultivated (INE, 2010). Traditionally cattle's keeping is very important and still plays a major role in the economic and socio-cultural life of the local communities. Livestock sector is mostly practiced by the smallholder; the farmers have a goat, pig and cows, grazing on open community natural grassland with grass such as *cyperus sp, panicum sp and urochloa sp*. The district has nearly 4,000 livestock breeders, mostly small-scale.

(Fig. 3) Vegetable seed-plot in Boane.

(Fig.4) A local farmer in Boane planted 80 mango trees.

In Boane the average size of farms is 0.8 ha (Fig. 4) rain feed with very low inputs such as mechanized agricultural operation, fertilization and irrigation. Non-agricultural production (timber forest products and non-timber forest products, fishing and hunting) is an important source of income.

Among the small-scale farmers the use of fertilizers, irrigation, and agriculture machinery is very low, that is why the productivity is very low; less than 1000kg/ha for corn and vegetables, and livestock grassland efficiency is very low.

During the last decades the pressure on the natural resources has increased. This is partly due to a rapid growth of the local population, high immigration and also establishment of new farmers coming from Maputo and South Africa (INE, 2010).

Because cultural reason and also because to the low investment in agriculture and also due to the poor know how, local small-farmers use agricultural practices commonly with very low productivity and negative impact on environment.

(Fig. 5) Beans and maize intercropping in Boane.

(Fig. 6) Degraded pasture in Boane, bared soil prone to erosion

The major environmental issues (Fig. 6, Fig. 7and fig. 9) in Boane are:

1. Grassland fires
2. Soil erosion

(Fig.7) Laboratory analyses of soil showed EC value of 0.5 mS/cm

(Fig.8) Grassland fires are very frequent in dry season.

The local community has a very simple lifestyle: a simple house (Fig.9) built by low quality local material, the diet is basically cooked cornmeal and curry (vegetables, beans, meat or fish) and fresh fruit (Fig. 10). Unemployment is very high, only 33% of working age people in formal employment, 67% of people has agriculture as main activity (INE, 2010). Fire is very important agricultural tool, farmers use fire to clean the land to facilitate the subsequent agricultural operations such as tillage, fire is also used in livestock to control shrub invasion in grassland and also to promote the regrowth of the grass outside the season.

(Fig.9) a house of a local farmer in Boane

(Fig.10) Small street market in Boane

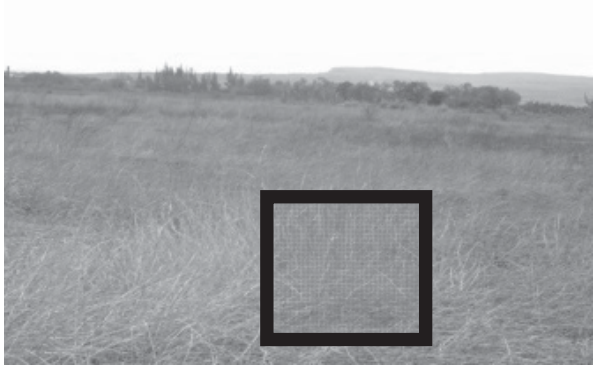
(2) Contents and activities during the overseas field training.

On 6th September, I went to Mozambique for oversea fields training, and on September 22nd my supervisor professor Dr. Kimura Sonoko Dorothea joined me in Mozambique as shown on table 1. My overseas field training title is "Environmental impacts of livestock activity and mitigation options: a case study of Umbeluzi region, Maputo province, southern Mozambique".

Table1. 2012 Antonio FOLENS Overseas training activity schedule

Activity	Month			
	Sept	Oct	Nov	Dec
Leave Narita at				
Contact at EM university and Boane agric. dept				
Preparation for field work				
Vegetations analysis				
Soil analysis and sampling				
Soil air dried				
Vegetation data analysis				
Soil laboratory analysis				

I collected data by interviewing with 24 farmers and extension service staff, asking about the grazing system that they use. Moreover vegetation where sampled using a 1x1 m quadrate (fig 11) for floristic composition. Soil samples (fig 12) were collected for determination in the laboratory pH, EC, C, N, CEC, cations and anions.



(Fig. 11) 1x1m quadrat method for vegetation sampling

(Fig.12) Soil sampling in Boane

Soil cover was estimated in percentage by eye Braun-Blanquet scale, this method consists in estimate vegetation cover in the soil using relative percentage from maximum of 100% for full covered soil and minimum of 0% for bared soil. Biomass yield was calculated by standing crop techniques consisting in collect vegetation sample in a quadrate minimal area 1x1 m dry for 24 hours at 105^{o}C and weighing the dried plant material at Eduardo Mondlane University, soil science laboratory (Kent and Coker 2000).

The counterparts in Mozambique where Mr. Zacarias and Mr. Santos from the Eduardo Mondlane University in Maputo, Mr Ricardo from SDAE Boane, Mr Munguambe that is the Massaca local community leader and Mr. Paulo that is a local farmer in Boane.

(3) Findings and achievements obtained significant experiences and lessons.

According to INE (2010), in Boane there are in total about 3 780 cattle and 5 000goats, there are 20 farmer owners of big cattle farm with total area higher than 50ha, and about 350 farmer own small cattle farm < 2cows and 5 goats. The majority of big farmers use modern livestock systems such as： rotational grazing, fencing, rest, cultivated pastures moreover big farmers produce hay and silage to supply the cattle during dry season. Small farmers use natural grassland areas which range from 5ha up to 50ha. Many of the farmers use harmful techniques such as, direct continuous grazing, overgrazing, grazing below the stocking rate, grazing out of season, grassland burning, and absence of beneficial management techniques such as fallow, rotational grazing and rest. Burning is very frequent among small-scale farmers; many of them burn about 3 or 4 times per year. Small farmers do not produce hay and silage.

Exceeding stocking rate, overgrazing can occur it leads to erosion and desertification, also exceeding stocking rate can cause soil compaction due to cattle trampling. Grazing lower than stocking rate leads to shrubs invasion, and to control shrubs invasion and promote regrowth of grasses, local farmers in Mozambique burns the grassland. These leads to lost of soil fertility, soil acidification and soil erosion.

The Boane dry grass savannas is dominated by grass, mainly *cynodon sp, cyperus sp, panicum SP, urochloa sp aristida sp,* and to a lesser degree by *hyparrhenia sp*, *heteropogon sp* and *themeda sp*.

During the dry season due to prolonged drought every year from June to November, the cattle seem to lose weight due to a shortage of pastures.

(Fig.13) Fresh grass *panicum Sp.* regrowth 20 days after burning. (Fig.14) Grassland pasture 20 days after burning in Boane

Burning grassland (Fig. 13 and Fig 14) remove unpalatable grass and also destroy the shrubs and weed in pasture, moreover it promote the regrowth of valuable grass palatable for livestock such as *cyperus sp, panicum Sp and urochloa Sp.* But burning the pasture grassland have many bad consequence to environment such as： fire destroy soil biota and soil organic matter, fire reduce the capacity of soil to retain water (Hydrophobicity), because the soil is bared soil temperature can increase and soil moisture can be reduced because the water is easily evaporated from bared soil, because soil is bared is easily eroded (Mccarron et al. 2003).

Laboratory analysis from soil sample collected in Boane showed that soils pH range from 5 (acidic), to 9 (alkaline). Acidic pH where frequently found in pastures land where burning frequency was higher than 3 times per year.

Wild land fires are one of the more severe disturbances for natural ecosystems and can become a critical factor in the process of soil erosion (Dimitrios et al. 2009). According to Dimitrios et al. (2009) wildfires, affect hydrological processes such as runoff and erosion are known to change significantly. Fires affect the physicochemical characteristics of the soil, increase surface runoff due to the complete or partial loss of vegetation and reduce water infiltration rates, water storage capacity, and soil particle aggregation stability.

This overseas field trip gave me opportunity to collect soil and vegetation samples for laboratory analisys. Observation and interview with farmers in Boane showed me how local small farmers still not know how to manage their grassland; moreover they don’t have enough money to invest in better technologies.

Livestock system in Boane seems to have a strong impact on the environment leading to environmental damage such as soil acidification, soil erosion and desertification.

In Boane pastures are "scarce" despite wide natural pastures grassland areas are available, due to lack of "know how" as well as lack of investment. Farmer in Boane make very little use of the potential they have and even more deteriorate the environment.

(4) Achievements and its future vision.

I am concerned with vegetal production, but I like to preserve the environment and nature. I think that

the best way to increase the agricultural productivity is to keep or improve environmental quality. Environmental leader must first be concerned with good environment; environmental leaders must fight to have a good knowledge to maintain environmental quality.

Environmental leaders must have exceptional vision, environmental leader must lead people and organizations that alone would not follow directions to improve agricultural production, improve environmental quality and improve living standards.

I think that for Boane case, the farmers have a chance to learn from mistakes from other countries such as South Africa in Kalahari desert, and many North African countries covered by Sahara desert. In Boane, the current environmental situation leads to desertification. Desertification is a very extreme case of environmental damage, and it is very difficult to reverse desert into fertile and productive soils.

My future vision is to contribute to improve agricultural production and productivity improving the environmental quality and improving living standards of the local communities. I want to teach environmentally friendly agri-livestock to farmers who do not know this type of agriculture.

I think that Boane farmers and others farmers in Mozambique must adopt techniques for live stocking such as rotational grazing, fallow, produce hay and silage to supply the cattle in dry season, and many others techniques that are sustain soil quality.

(4) Acknowledgement

I want to thank my supervisor Professor Dr. Kimura Sonoko Dorothea for showing me the path of science, and also because of the Kimura sensei show patience and care for my work.

I want to thank to all FOLENS professors because they teach me much useful matters related to environmental leadership.

And I want to thank to all FOLENS staff because of the financial support and the opportunity of overseas field trip to Mozambique.

I want to thank to all TUAT IEAS professors because they teach me a lot of environmental science and agriculture science and all Professors are really friendly.

I want to thank the pastoralists and agro- pastoralists of Boane specially Mr Munguambe, Mr Paulo, Ms Halima, Mr Guilherme and all farmers from Boane that allow us to sampling in their farm.

I would like to thank Professor Maposse, Mr. Zacarias and Mr. Santos, from Eduardo Mondlane University in Mozambique.

I thank SDAE Boane (Serviço de Actividades Económicas de Boane) specially Mr Ricardo.

Also I want to thank my entire friend's student from TUAT IEAS and FOLENS.

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(Supervised by Dr. Kimura Sonoko Dorothea)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Assembly of a particle collection system with high mobility to understand atmospheric particles in Malaysia

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Destination and period: Serdang UPM, Malaysia, Jun. 25-Aug. 3

Key words: Aerosol, Particle collection, Passive sampler,

Abstract (approximately 200 words)

I visited Universiti Putra Malaysia (UPM) in Malaysia for 39 days. The purpose of this field training was to assemble a particle collection system and collect particle suspended in the gas phase. For comparison, a commercialized instrument for particle collection was also used. The assembled collectors (totally 3 collectors) were placed in UPM campus for long-term experiments (more than 30 days) and near highway for short-term experiments (1 days). The commercialized one using a fiber filter was run for totally 6 days. The surface of the filter changed from white to black in color after 1 day of particle collection. This implies that a lot of particles were accumulated on the filter. In the experiments of the assembled sampler, particles suspended were deposited on plate-type metal substrate, being confirmed by a scanning electron microscope, but it cannot be recognized by naked eyes. It suggests that particles with lower concentration were deposited. This collector was able to be made without high expense and elaborate assembly. Therefore it can be placed in anyplace because it is affordable for us. Under condition that stuffs for the experiments were limited, the experiments were carried out. This implementation was owed to many people who helped me with my activities. Through this training, I learned how to apply skills and knowledge that I learned for practical use under limited conditions. I strongly felt how important communication skill is to involve people surrounding me to do work as well.

(1) Contents and activities during the overseas field training (less than 600 words)

The purpose of this Overseas Field Training is to assemble a particle collection system. As a host place, I selected UPM and prof. Mohamad Pauzi Zakaria in Faculty of Environmental Studies in UPM, which is studying on particulate matters. His laboratory has a high volume sampler. In this training, I made

assembly of a particle collector, and placed it around UPM. For comparisons, particle collection using the high volume sampler was also conducted.

In first a week (25th Jun.- 30th Jun.), I spend preparing of assembly of a portable particle collector (passive sampler). I focused my mind on making the system made from local materials. Then I didn't bring anything to prepare it. I walked around UPM to look for shops to buy stuffs for it. After I collected all stuffs, I tried to design and assemble it in the room that a staff in UPM readied me. Figure 1 shows the stuffs and the assembled sampler. I stalled a circuit inset "mosquito killer" into the sampler to be able to run with only a battery cell. I placed the samplers in some places in UPM campus. It worked using battery cells that can last for 8 hours. Particle collection using the sampler was implemented for 30 days, several weeks and 1 day.

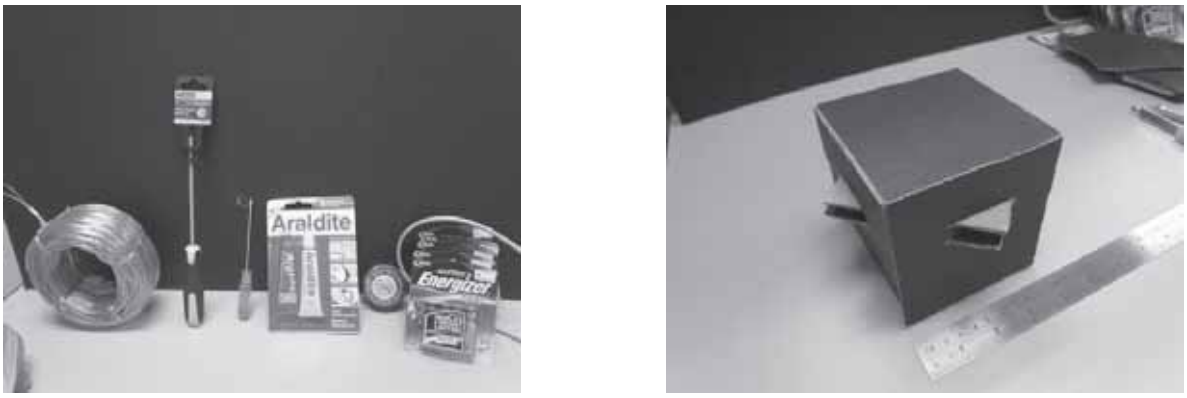


Fig. 1. (left) Stuffs purchased in shops around UPM and (right) assembled sampler

On 2th Jul., I visited to one of the biggest factory to treat industrial wastes to see what happens to environmental sections in Malaysia. As result of the waste treatment, gasses that can become particulate matters as air pollutant are emitted at exhaust.

Fig. 2 Plant factory for waste treatment

From 3th Jul. to 5th Jul., I attended International conference in Singapore with respect to particle technology. In the conference, I presented a topic on an environmental sensor to trace chemical residue such as pesticide. I was able to spend precious time to exchange our thoughts and to know how other researchers think scientific activities in relation to environmental sections.

Next week (9th Jul. – 13th Jul.), I planed and arranged to use a high volume (HV) sampler for comparison with the assembled sampler. The high volume sampler was located on rooftop in a building in Faculty of Environmental Studies. So, the place where I conducted particle collection by using the assembled sampler was also the same site. Glass filter was selected as collecting surface in the HV sampler.

On 12th Jul., Dr. Ahmad zaharin aris in Faculty of Environmental Studies who is one of FOLENS members holed a meeting at which I can talk my research topic and exchange information on background between us (as shown in Fig. 3).

Fig. 3. Scenery of meeting

From 17th Jul. to 27th Jul., I conducted experiment of particle collection using the HV sampler. Each condition of the experiments required a day, and then totally 6 samples (6 days) were taken. In a few days of the period, I cannot help but suspend the experiment because of bad whether (heavy raining).

On 31th Jul., I and Prof. Pauzi went to highway near UPM campus to place the assembled sampler, where a lot of cars pass through there everyday. Then I hanged the samplers (3 units) on palm tree as shown in Fig. 4 at 10:00 am. At around 17:00, I pick them up.

In other days, I visited Dr. Mohd Nazli Naim in Department of Process and Food Engineering. He and I designed a particle generation system to model particle suspended in the gas phase. We can conduct experiment on air pollution in a laboratory using this system, which can minimize number of experiments. This point is pretty important; it's because we should engage environmental issue and reduce waste we will produce even for our experiment. Figure 5 presents particle generation system we made.

Fig. 4 Passive sampler placed near highway

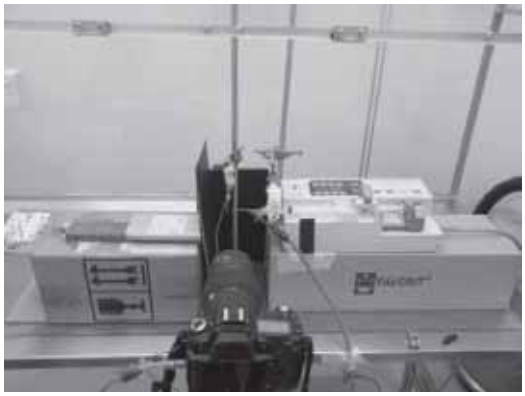


Fig. 5 System of particle generation

All samples obtained in this training were carefully covered with aluminum sheet, then stored in plastic bag, brought to Japan.

In this country, atmospheric particles as air pollutant have been concerned. It is suspected that they are originated from bio-burning process being conducted in Indonesia, and emitted particles can travel a long distance. To make it worse, the particles decrease visibility of air called as “haze”. Furthermore it is said that it may cause disease such as respiration problem. In the country, they cannot live without a car as transportation method. Particles generated from gas emitted by a car should also be concerned. After 1 day running of the HV sampler, filter surface changed to black in color as shown in Fig. 6. In Japan, it is hard to imagine for Japanese, because public transportation (train or subway) especially in Tokyo is much more effective. When I asked local people about the air pollution, they already understood it. Nonetheless it seemed that they were not interested in changing their life style. Ironically many car companies in Japan ship their products to this country. Actually I saw a lot of car passing on the road. For those reasons, monitoring particle transportation is quite important for both positions (particle emitter and receiver).

Fig. 6. Photograph of surfaces of filters used: (left) non-treated and (right) treated by palm oil

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

First of all, before I went to UPM as field training, I determined concept for the training, which was to make something to be useful with low cost and simplicity. Therefore I didn't bring stuffs for the experiment. When it comes to working world wide as a field-oriented leader, I think we have to make or achieve something from scratch. Because I'm from engineering department, I thought I should make device or establish method to analyze samples. I believe we (engineer) provide good system to evaluate some conditions, and then people in environmental fields conduct analysis and experiment by using our established method. This can be good relation between us to contribute our scientific activities to environmental issue we encounter. The place where I stayed was in Faculty of Environmental Studies. I felt that their and our cultures (approach style to achievement) were much different through our conversations on studies. Actually I confused their styles when I talked their studies firstly. This situation was good experiences for me, because I learned their style for research and what are our jobs. Our missions we have to meet out provide tools with accuracy and simplicity that they can use as analyzer and evaluation method. On their positions, they need a large number of data to satisfy reliability of their obtained data. I'm sure that our thoughts to provide more correct and simple tools will be welcome to them. For example, the assembled sampler in this activity was completed with less 1,000 YEN per a sampler, which imply that it can be installed in any places where people want to collect particles. Also, a filter used in the HV sampler was treated by palm oil to make hydrophobic surface, while raw material of the filter is made from quartz (hydrophilic). Just this simple idea can solve the interface between physical particle deposition and chemical property of the particles. As shown in Fig. 6, it apparently seems that efficiency of particle collection on the treated surface is higher than that on non-treated surface. In other words, chemical property of particles suspended in the gas phase is likely to be hydrophobic, which means that we may have to replace a quartz filter used for particle collection with a hydrophobic-modified filter.

In practical aspects, I strongly felt that communication skill was one of the most important points for conducting activities as field-oriented leader, which is not only ability of speaking English, but also how we convince them to do work together. To get to know each other, we need to understand their backgrounds, which are their history, and life style and religion if they have it. In Malaysia, people who are originated from Indonesia, Chinese and India live each other. Surprisingly they understand and are respect the other

cultures. For instance I experienced “fasting” which muslim don’t eat in day time for a certain period at all. Chinese and India tried not to eat something in front of muslim to show their respect to muslim. I think a field-oriented leader should be approachable to work with people.

In summary a field-oriented leader should provide tools for practical activities and lead people to conduct them with approachable characteristic, if he or she comes from engineering people. This means that different leaders have different backgrounds. We need to do the best that we can do as an environmental leader.

Regarding overseas field raining, most of facilities collaborated with FOLENS are in environmental fields. Through my experiences in Malaysia, I was stimulated into my thoughts because it was my first time to communicate with people who have different background with me. It was so fresh and precious for me, and then many ideas came up with me. Among those who are mostly from agricultural department (environmental field), it is unfortunate they don’t have much opportunity to experience different cultures in research fields. FOLENS program is better to collaborate with other fields such as engineering. We cannot solve our environmental issues without their technology and skills. On the other hand, there are a lot of good points in this training. Firstly their focusing countries are in Africa and Asia. We can select any universities located in the area, even though they are not registered as FOLENS host. Because I’m sure that developing countries get to “developed” countries, working places we should dedicate ourselves to environmental issues are exactly there. Looking at the countries on time when I’m student is also good point as well. We can experience how we plan our activities with limited budget in visiting country, which we cannot experience often on student.

(3) Achievements and its future vision (less than 400 words)

Through my work in UPM, I assembled a portable particle sampler that can be used for any places. This sampler was made due to a lot of cooperation in UPM members. The experiments were conducted for time ranging from 1 day to 30 days. Results from the samplers indicate that the portable devices can be distributed over the world. I hope that database for information on particle deposition can be made using the device, and used as a useful tool to investigate air pollution. In experiments using a high volume sampler, particle deposition with high concentrations was observed.

I believe that I achieved to perform my work I planed in Malaysia, and proved to make a good method with simple way. In order to carry out those, I was able to communicate with people well, and tell my style as an engineer to them. It took much time to make them understandable, but I think it is necessary to become a good field-oriented leader. As a first step to be the good leader, understating their cultures in Africa and Asia is priority. Through activities in relation to environmental section such as international conference and symposium, I would like to have good friends with the same vision and age preferably, because our generation has to attempt to solve environmental issues for making sustainable society. Since I strongly felt that engineering technology is required to give reliable tools for environmental assessment, my topics in doctoral course should involve contents in relation to environmental section. For the purpose, more collaboration among different research fields is required. I will present my work at conference in different

fields with me.

(4) Acknowledgement

I gratefully thank to Dr**.** Mohd Pauzi Zakaria, Ahmad zaharin aris, Mohd Nazli Naim for accepting me to stay in their faculties, valuable advise and opportunity to conduct my experiments.

(5) References

(Supervised by Wuled Lenggoro)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Studying of Bio-ethanol application in Thailand ~Investigation of environmental pollution by Bio-ethanol production plant~

Genki Muto
1st grade of Master, Department of Applied Chemistry, Tokyo University of Agriculture and Technology
Destination and period: 2012, August, 4-12

Key words: Bio-ethanol, Sugar cane, Water pollution, Liquid fertilizer

Abstract (approximately 200 words)

In Japan, there are 255 million ton/year biomasses but they aren't made effective use. On the other hand, much Bio-ethanol are made from biomasses like a sugar cane and so on, and utilized as a gasoline in Thailand. So, I learned Bio-ethanol application system that relationship among government, engineers and farmers in Thailand because of widespread Bio-ethanol in Japan. Then, chemical plants generally emit wastewater. Investigate of how to treat a wastewater, and wastewater treatments don't effect environmental pollution.

Bio-ethanol application system has two key points. First, cut down the tax stimulates a demand of gasohol which is gasoline includes bio-ethanol, and biomass price increase. Second, engineers and farmers make a win-win relationship.

I surveyed MITR PHOL Bio Fuel Company's Bio-ethanol plant at Suphan-Buri in Thailand to learn wastewater treatments. This plant used wastewater which was emitted from distillation as a fertilizer they called "Viness". Nitrogen concentration of Viness was 4700 mg-N/ml. It was 3.7 times higher than general liquid fertilizers. And adsorbed nitrogen concentration of a soil at sugar cane field was 8.2 mg-N/kg-soil. This data indicated water pollution of nitrogen salts at sugar cane fields, but this data weren't enough to evaluate environmental pollution.

We need to know viness application rate into sugar cane field and investigate water near sugar cane field or leaching solution.

(1) Contents and activities during the overseas field training (less than 600 words)

Title of Overseas Field Training

Studying Bio-ethanol application in Thailand

~Investigation of environmental pollution by Bio-ethanol plant~

Names of counterparts and professors

- Supervisor: Kenichi Yoneda (Associate Professor FOLENS)
- Lecturer: Akihiko Terada (Associate Professor)
- Visiting Professor: Eiichi Kawai（Asia Science and Education for Economic Development :Asia SEED）

Training schedule

DATE	Visiting place
4 Aug.	Go to Thailand (Haneda Airport → Bangkok → Phuket)
5 Aug.	
6 Aug.	Incinerator Survey in Phuket
7 Aug.	Hua-Hin and Photharam landfill Sampling
8 Aug.	Bio-Diesel Plant Survey in Saraburi
9 Aug.	Bio-Ethanol Plant Survey in Suphan Buri
10 Aug.	DNA extraction in Kasesart university in Kamphaeng Saen
11 Aug.	Discussion with Kasesart Bang Khen Professor Leg
12 Aug.	Go to Japan (Bangkok → Haneda Airport)

Training contents

- Interview local people about Bio-ethanol

  I interviewed Mr. Gig who is a master course student of Kasetsart University. He said that the Thailand government promoted to make bio-ethanol and use for gasoline. First, the government cut down the tax of Gasohol which is mixed with gasoline and bio-ethanol to familiarize Gasohol. And car drivers were delight to buy cheaper Gasohol as a gasoline. Then much gasohol sold, Bio-ethanol plant noticed that Gasohol become a big seller. And they bought more biomass and produced more bio-ethanol. Finally, biomass price became higher and farmers produced more biomass. So, engineers and farmers made win-win relationship.

On the other hands, Gasohol utilization has a potentially detrimental effect on atmosphere environment. He has developed asthma and went into a decline it when walked a busy arterial road.

In conclusion, Bio-ethanol production and utilization are familiarized under the initiative of government of Thailand, but there is fear that atmosphere pollution.

- Samplings and experiments

Wastewater from distillation in surveyed bio-ethanol plant was utilized liquid fertilizer called "Viness". Viness was collected about 50 ml and diluted about 1000 times, filtered a membrane filter with 0.45 μm in pore size. Then, NH_4^+, NO_2^-, NO_3^- in Viness samples were measured with an ion chromatography analyzer, whereas TN was measured with a TOC/TN analyzer.

And soil was collected about 150 cm^3 at 5 cm depth in sugar cane field near surveyed plant. After 4 g soil were added 0.01 M potassium chloride (KCl) solution into 40 ml, shook (140 rpm) 1 hour and separated by centrifugation to desorb some nitrogen compounds.

Soil sampling at sugar cane field

Viness

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

・The result of analyzed nitrogen concentration included Viness and adsorbed soil, Viness has higher total nitrogen concentration (4700 mg-N/L) than general liquid fertilizer (1300 mg-N/L). It indicates Viness is good fertilizer for growing plants.

・And soil adsorbed nitrogen concentration was 8.2 mg-N/kg-soil is higher than paddy field soil in Japan (4.5 mg-N/kg-soil). If Viness was fertilized more than necessary, over nitrogen run out sugar cane field and mess up water pollution. So, this data might indicate water pollution by high nitrogen concentration, but weren't enough to evaluate environmental pollution.

・In conclusion, Viness has a potential as a liquid fertilizer because it contained higher nitrogen concentration than a liquid fertilizer. However, environmental impact Viness application into sugar cane is unclear in this field trip.

(3) Achievements and its future vision (less than 400 words)

It is necessary to investigate an environmental load of Viness application into sugar cane fields through this field trip.

・We need to clarify the fate of nitrogen that is taken up by plant or leached into the underground.

・We need to evaluate greenhouse gas emission from sugar cane fields. Because of generally high nitrogen fertilizer put into soil after high amount of nitrous oxide are emitted as a greenhouse gas.

Finally, I learned importance of combining agriculture with technology for creating recycling society in this field trip. I'd like to become a leader with perspective of combining agriculture with technology to create recycling society in my hometown Akita.

(4) Acknowledgement

(5) References

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Clarification the causes of Arsenic(As) contamination in the landfills of Thailand

Keisuke Yamada
1st year of Master's Course, Engineering, Tokyo University of Agriculture and Technology
Destination and period: Thailand, 4 Aug. - 12 Aug. 2012

Key words: landfill, Soil pollution, Arsenic contamination, Water pollution

Abstract

I analyzed the heavy metal in the leachate of the landfill and the near groundwater and evaluated the degree of the pollution. It was found in the previous reports that the arsenic, manganese and lead of the leachate were over the standards of the Thailand industrial effluent quality. Therefore I studied the cause of such heavy metal pollution and considered the countermeasure is nenecessary. I sampled the soil and leachate of the landfill. I preprocessed to dissolve the soil and analyzed the heavy metal by ICP-MS. In addition I tested to find where arsenic comes from, from the soil or the garbage. In addition I found field working in the different cultures and countries is very hard. Now I could image and understand how the working in Asian, African or other countries is difficult. I could analyze and test the leachate and soil of landfill. I found the arsenic in landfill is not coming from soil. Through this oversea training I found my specialty and confidence spread widely and deeply.

(1) Contents and activities during the overseas field training

Title of your Overseas Field Training

Clarification the causes of Arsenic(As) contamination in the landfills of Thailand

Names of the counterparts and professors

- Professor Akihiko Terada (supervisor)
- Professor Yoneda
- Professor Tiwa（Kasetsart University）
- Professor Lek

- Professor Eiichi Kawai（Asia Science and Education for Economic Development :Asia SEED）

Training schedule

4 Aug. Koganei → Haneda Airport (Train), Haneda → (Air)
5 Aug. → Bangkok (Air), Bangkok → Phuket (Air)
6 Aug. Garbage incineration facilities survey in Phuket City, Phuket → Bangkok (Air)
7 Aug. Field survey on soil quality in Refuse dump near Hua-Hin (soil sampling, GPS survey, interviews to local people, etc)
8 Aug. Biodiesel facilities survey in Saraburi, Bangkok → Kamphaeng Saen(Van)
9 Aug. Meeting with Kasetsart University Kamphaeng Saen
10 Aug. Sample and discussion in Kasetsart University Kamphaeng Saen
11 Aug. Discussion with Kasetsart University Bang Khen Prof.
12 Aug. Bangkok → Haneda (Air), Haneda → Koganei (Train)
(the total period: 9 days)

The Purposes of the Oversea Field Training with supervisor

- To get the field oriented mind and skills sets by working on my research topics in the field
- To clarify the causes of Arsenic(As) contamination in the landfills of Thailand
- To check my level of communication skills, I think the most important ability to become a leader, overseas

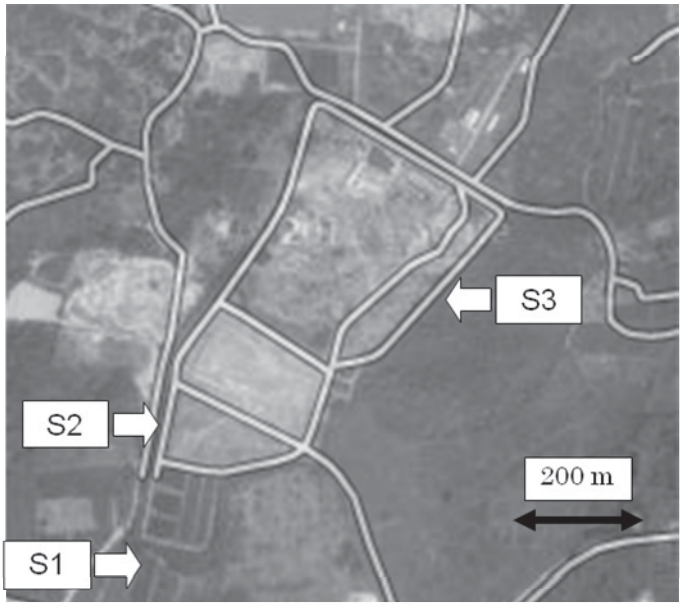
Sampling points in the Hua-Hin landfill

The Soils

S1:
Near the observation well

S2:
Near the landfill

S3:
At higher place than the landfill



Hua-Hin landfill

In Thailand 65% of municipal waste is disposed of in Open Dumping site and the remaining 35% in sanitary landfills.
Hua-Hin landfill is a sanitary landfill.

Most of the waste is not covered with soil, so the rain water flows around the landfill as leachate.

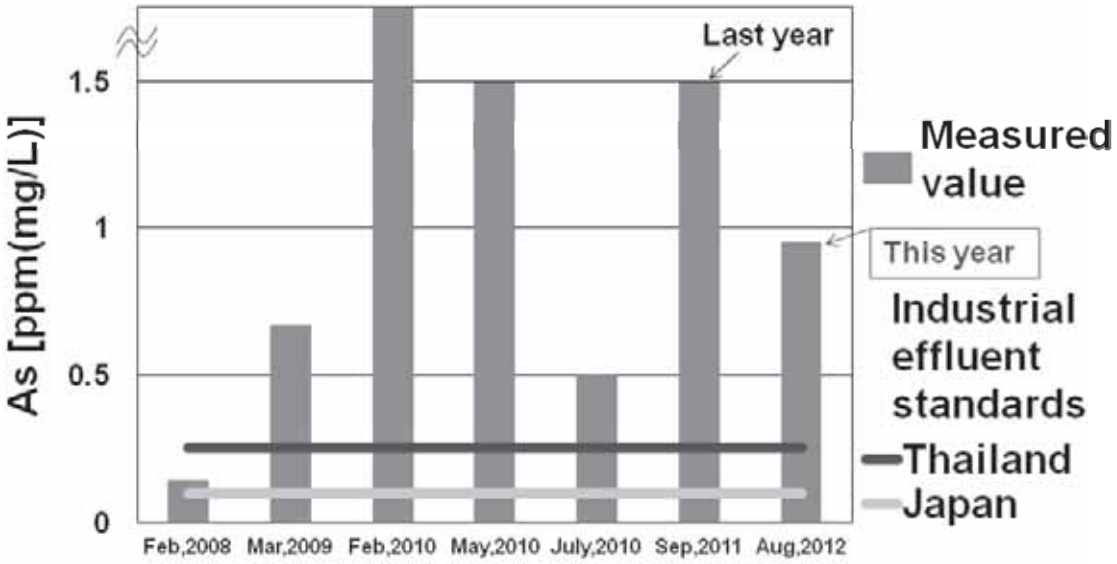
Cooperate with the local people～Sampling the leachate and the soil

In order to search where As is coming from, I have sampled the leachates and soils in cooperation with the local people.

I analyzed the amount of As in the leachates,
the elution amount and
the content of As in the soils.

(2) Findings and achievements obtained, significant experiences and lessons

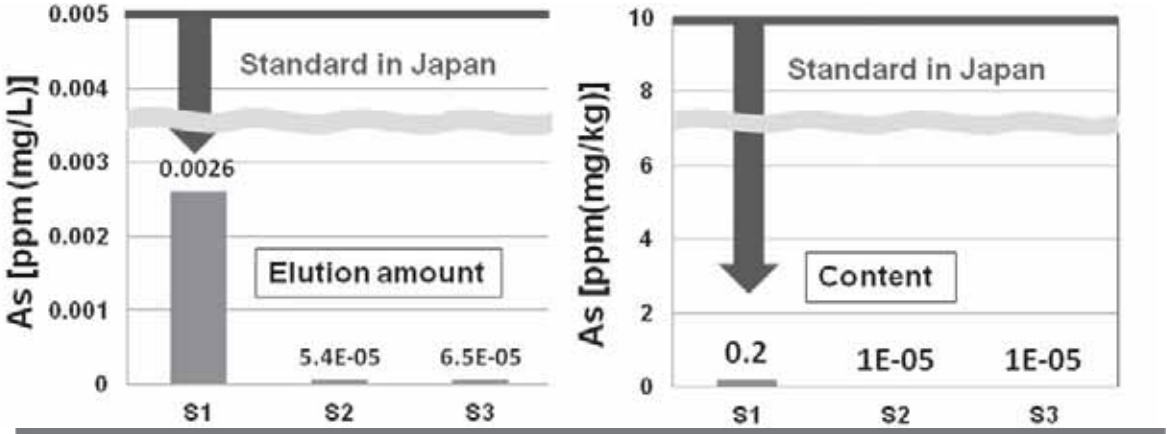
As concentration of the leachate in the observation well



The leachate contains a high concentration of As
→ It is necessary to clarify the causes of As contamination

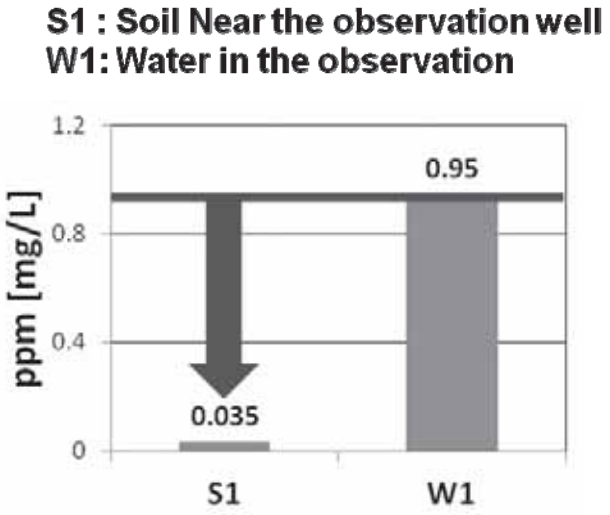
Analysis of the soil

S1: Near the observation well
S2: Near the landfill
S3: At higher place than the landfill



Results of the analysis were significantly lower than both the elution amount standard and content standard in Japan

Adsorption experiment



As in the leachate was adsorbed to the soil more than 95%
→ I consider that the As of the leachate in the observation well is not dissolved from the soil

Discussion

- Results of the analysis were significantly lower than both the elution amount standard and content standard in Japan
- Arsenic in water was adsorbed to the soil about more than 95%

- As does not dissolved from the soil

→ I consider that the As is dissolved from the garbage

Communicate with the local people

- I met the Regional Environment Office Staffs and Visited the REO8 Staff house.

REO8(Regional Environment Office) Staffs

Visiting the REO8 Staff house

- And I ate Dinner with people who works in Thailand. At this time, I have met people who are involved in the TUAT.

Dinner with people who works in Thailand

- Besides, I Communicated with Kasetsart Univ. students.

Communicate with Kasetsart Univ. students

- Then, the man is Kasetsart Univ. student Gig san helped us. He was shy, but He is my friend.

Kasetsart Univ. student Gig san helped us

- Next, I went to Ayutthaya and I met him. Then, He told me the Culture of Thailand.

With Industrial dep. staff at Ayutthaya

- And, I was able to eat dinner with Thai people again. They are very nice man and women.

Dinner with Thai people

- Finally, I communicated with Kasetsart Univ. Prof. of Engineering. I talked in Thai language to the staffs of hotels and shops for a week. When Prof. Lek hear my Thai language, he said if you stay for one more month, you could communicate with Thai people in Thai language. I got the confidence to work in Thailand.

With Kasetsart Univ. Prof. Lek of Engineering

(3) Achievements and its future vision

Conclusion

- Research problems still remain, but I will get the field oriented mind and skill sets by overcoming them in this next academic year.
- By the analysis of the soils and the adsorption experiment about As, I consider that the origin of the dissolution of As is predictable for the garbage.
- I got the confidence of communication skills required for leaders.

Actions for the future

- In order to consider the causes and countermeasures of As contamination, I would like to participate in the oversea training for next year even if at my own expense.
- To make the best use of this experience, I would like to work abroad in the future.

(4) Acknowledgement

I am grateful to Prof. Tiwa, Prof. Kawai, Prof. Lek. I want to thank Mr. Gig and laboratory member of Kasetsart University and Mr. Gei, Mrs. Su, and Ms. Ant. I received generous support from Hosomi & Terada Lab. Member. I would like to express my gratitude to Prof. Hosomi. And I have had the support and encouragement of member of this field training, Prof. Yoneda, Prof. Terada, Prof. Ozaki, Prof. Prof. Ninomiya , Prof. Imai ,and Masahiro, Genki.

(5) References

1)タイ都市ごみ処分場の状況
http://www2.jica.go.jp/hotangle/asia/thailand/000772.html

2)タイの砒素汚染
http://www.asia-arsenic.jp/top/?page_id=297

3)メコン河下流域のラオス，タイおよびベトナムメコンデルタ東部 における地下水のヒ素汚染
http://www.ehime-u.ac.jp/~cmes/koza/05/060321/inoue.pdf#search=%27%E3%82%BF%E3%82%A4%20%E7%A0%92%E7%B4%A0%E6%B1%9A%E6%9F%93%27

4)地下水中に溶存する金属類（重金属を含む）や、主要イオンを分析する際の採水に関する留意点
http://www.technointer.com/GroundwaterEquipments/references/Groundwater/GW04-MetalSamping.html

6)ヒ素の水環境中における存在形態とその挙動
http://www.pref.saitama.lg.jp/uploaded/attachment/15071.pdf#search=%27%E3%82%BF%E3%82%A4%20%E7%A0%92%E7%B4%A0%E6%B1%9A%E6%9F%93%20%E6%B8%AC%E5%AE%9A%E9%87%91%E5%B1%9E%27

(Supervised by Prof. Yoneda)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Research of residual pesticide in soil and evaluation of the risk in agricultural area

Masahiro Yamamoto
1st year Master's degree student, Department of Applied Chemistry, Tokyo University of Agriculture & Technology (TUAT)
Destination and period: Thailand, 4 Aug -12 Aug

Key words: residual pesticide, agricultural area, Thailand,

Abstract (approximately 200 words)

The agricultural products occupy 19% of total exports in Thailand. In Thailand, pesticides are much used to improve amount, quality and appearance of the agricultural products. There is a lot of research about the residual pesticides in the agricultural products. But there are a few researches about the soil of agricultural products. Other researches show that pesticides cause some health issues of the children whose parents are farmer. The reason of this problem is that they play in the agricultural field.

In this overseas field training I investigate the residual pesticide in the soil of agricultural field. Then by using this analysis result I would evaluate the health risk on the field.

I sampled soils from 6 agricultural fields near Kasetsart University (Kamphaeng Sean Campus). In these fieldes some agricultural products are cultivated and exported. In this research I chose a pesticide, "Cypermethrin" as an analysis compound. It was reported some times that cypermethrin remained over standard in the products from Thailand. I am now analyzing them by GC/MS. The reports about this cypermethrin in Thailand crops are not published yet. I think my study is important and highly required.

(1) Contents and activities during the overseas field training (less than 600 words)

Title of your Overseas Field Training

Research of residual pesticide in soil and evaluation of the risk in agricultural area

Names of the counterparts and professors

Accompanied Professor

- ○ Associate professor Akihiko Terada
- ○ Associate professor Kenichi Yoneda

Advised Professor

- ○ Professor Tiwa Pakoktom (Kasetsart University)

Counterparts Professor

- ○ Lecture Uraiwan Ninpetch (Kasetsart University)
- ○ Lecture Lek (Kasetsart University)

Training schedule

4 Aug. Go to Thailand, flying overnight
5 Aug. Change the airplane at Bangkok, arrive at Phuket
6 Aug. AM: Garbage incineration facilities survey in Phuket city
PM: go to Bangkok
7 Aug. Field survey on soil quality in Refuse dump near Hua-Hin (soil sampling, GPS survey, interviews to local people, etc)
8 Aug. AM: biodiesel facilities survey in Saraburi, Bangkok
PM: go to Kamphaeng Sean
9 Aug. AM: meeting with Kasetsart University (Kamphaeng Sean Campus)
PM: my sampling at farm near Kasetsart University (Kamphaeng Sean Campus)
10 Aug. experiment at Kasetsart University (Kamphaeng Sean Campus)
11 Aug. AM: sightseeing
PM: meeting with Prof. Lek at Bangkok
12 Aug. Go back to Japan

(The total period: 9days)

Training content

・Sampling (my research in Thailand)

Soil samples were taken from 6 types of field near Kasetsart University, Kamphaen Sean Campus. Prof. Uraiwan introduced us the owner of the fields. The agricultural products cultivated at the fields are shown table 1. At two fields two products are cultivated in line. Because the fields are large, I sampled from some sites in same field respectively but Red pepper and Pepper(1) are not large field so that I sampled one and two sites respectively. Fig. 1 shows sampling sites of Onion(2).

Table 1. Details about sampling sites

Product①	Product②	Numbers of sampling site	export
Onion(1)	Tomato	3	×
Onion(2)	Corn	3	×
Red pepper		1	×
Pepper(1)		2	○
Taro		3	○
Pepper(2)		3	×

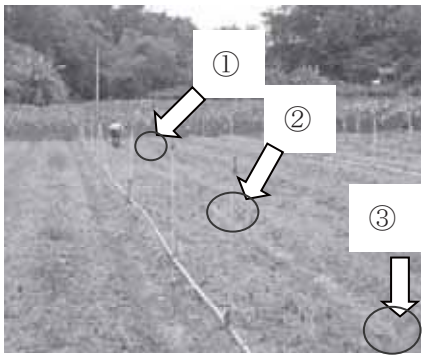


Fig. 1 Sampling sites of Onion(2)

・Interview

I interviewed farmer. She said that taro cultivated for overseas had contained more pesticide than the standard. Because of this, no plants were cultivated at the field for taro and the field had to be left for 6 month. She showed me the pesticides she always used (Fig. 2). She uses about 10 types of pesticides. Almost of them may be insecticide and they are used for each target respectively. They are not used every day. For example, the green box is used for 12 days after products are harvested to prevent insects.

Fig. 2 Interview to farmer

・Experiment

Extraction of cypermethrin from soil samples is referred some references but I cannot prepare some extraction kits. So that extraction method I tried is shown below.

First, acetone as a solvent is added 20 g of soil sample and shaking extraction and microwave extraction are carried out in line. After that the sample is centrifuged and the top clear layer is collected. To left solids new acetone is added and same operation is carried out once again. Collected acetone is evaporated and determined quantity. Then cypermethrin in acetone sample is analyzed by GC/MS with below conditions.

【Equipment for analysis】

Device name: GC/MS

Column: HP-5ms (30 m×0.25 mm×0.25 μm)

Injection: splitless

Inlet temperature: 250℃

Carrier gas: He (104 kPa, 1.4 mL/min)

Ionization temperature: 150℃

Temperature program ;

80℃, 1 min → 25℃/min, until 250℃ → 250℃, 23 min
→ 25℃/min, until 270℃ → 270℃, 2 min　(total time: 33.6 min)
Injection volume: 1 μL
Ionization method: EI、70 eV

Now I draw the calibration curve of cypermethrin. After this I verify the reproducibility of extraction method and try to analyze.

・Garbage incineration facilities survey at Phuket

We observed the forefront incineration facilities which Japanese company constructed in Thailand.

・Sampling at Hua-Hin Refuse dumping place for household garbage in Ratchaburi province

We took some samples (water in the observation well, leachate), one of the student measure heavy metal contained in them.

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

・The research in this overseas field training is not directly related to my master course research. My research of master course is "Development of low-cost treatment technology for dioxins contaminated soil/sediment with charcoal". However, therefore I could consider actively that what problem occurs on the field. Through considering what I can do in the problem, I experienced the first step for field-oriented which is this program's concept. I feel this experience will be also greatly useful for my research.

・Second, I could directly watch the conditions of the field and also talk with farmer. Therefore I clearly understand the present conditions of it by my senses. I mentioned above but the taro farmer cultivated had contained more pesticide than the standard. This fact made me surprised. I had thought that the producer whose agricultural products contain more pesticide than the standard has large scale of agricultural use and cannot mange properly in the detail of the field. However the farmer I visited and sampled does not have large field and recorded firmly about spraying pesticides. I experienced the difference of my image and the present. Then I felt necessity of improvement of direction for using pesticide by government and complicated using method. For example government announces the risk of pesticides in lecture at fixed interval or lecture DVD of handling pesticides are attached to pesticides.

・Third, I felt large differences between Japan and Thailand by watching present waste treatment in Thailand. In Japan final disposal method of general wastes is incineration. On the other hand in Thailand the wastes go to refuse dump. This dumping site in Hua-Hin gives out bad smell which I never have smelled in Japan. However, I could watch gradually changing over to incineration by survey of incineration facilities in Phuket. At the Kasetart University I had a chance to talk with students. I talked about incineration facilities in Phuket with them but they could not understand that wastes are incinerated. In this experience I learned that common senses for me change in another country.

(3) Achievements and its future vision (less than 400 words)

・Through these experiences I felt deeply that it is important to know the site with me eyes. The information about the site to determine a theme of this training by internet or paper did not have reality. However, when I went to the field I could felt its present conditions by my senses and the impression about real field was changed dramatically. As activities of FOLENS in remaining a year I would try to go to the site and experience a usual life of people at the site. Then I would like to share their thinking and consciousness with them. I think this approach is very useful to understand the real from a standing point of them and this is the first step to become a Field-Oriented Leader in Environment Sector.

・As a future schedule I would analyze and evaluate the samples. Because cypermethrin is a substance which becomes to be noticed in recent years, there are a few researches of it. The animal aspects are researched one by one. In rat examination toxicity of cypermethrin becomes to evaluate. Simultaneously researches about cypermethrin are to be in the process of starting. I would give a result of this training as early as possible and I hope that my result make new findings and make use of future works.

(4) Acknowledgement

I am deeply grateful to Prof. Tiwa, Prof. Uraiwan.
I want to thank and Mr. Gi and laboratory member of Kasetsart University
I received generous support from Hosomi & Terada Lab. Member.
I would like to express my gratitude to Prof. Hosomi.
And I have had the support and encouragement of member of this field training, Prof. Terada, Prof. Yoneda, and Genki, Keisuke.

(5) References

・ANNA SANNINO, MIRELLA BANDINI, and LUCIANA BOLZONI, Determination of Pyrethroid Pesticide Residues in Processed Fruits and Vegetables by Gas Chromatography with Electron Capture and Mass Spectrometric Detection, JOURNAL OF AOAC INTERNATIONAL VOL. 86, NO. 1, 2003

(Supervised by Prof. Kenichi Yoneda)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Water quality impacts to agriculture products, Case study in Karakalpakstan, Uzbekistan

Vladimir JOLLIBEKOV
Master course student, Department of International Environmental and Agricultural Science,
Tokyo University of Agriculture and Technology
Destination and period: 6 August-26 September, Karakalpakstan, Uzbekistan.

Key words: fermers, irrigation, crop yield, questionnaire survey, productivity

Abstract

Irrigation plays a very important role in producing various crops all over the world. There are some areas where no crops are able to grow without irrigation. Apart from those areas, rain fed agriculture is dominant. To stabilize and increase crop yield in semi-arid area, where rainfall is insufficient and unreliable even during rainy season, supplemental irrigation is essential. Main characteristic of irrigation agriculture in Karakalpakstan is that crop production is strongly relying on irrigation water because of low precipitation. And also lower temperature in winter and government control of cotton and wheat marketing are affecting the agriculture in Karakalpakstan. Field Research conducted in Karakalpakstan (Chimbay and Nukus districts) in August/September is a part of research entitled "Water quality impacts to Agriculture products in case of Karakalpakstan, Uzbekistan". The research aims to explore impacts of water quality to agriculture products through Questionnaire Surveys.

Contents and activities during the overseas field training

My overseas field research title is the `Water quality impacts to Agriculture products` case study in the Republic of Karakalpakstan, Uzbekistan. The research had conducted in the summer vacations; exactly date is between 6 of August up to 27 of September. Research has conducted under supervision of prof. Yoshiko KAWABATA and counterpart prof. Slava APARIN. My overseas-filed schedule is the followings:

Date	Destination	Activity
06/08/2012	Tashkent	Narita to Tashkent
07/08/2012	Tashkent	Workshop between TUAT and Government of Uzbekistan
08/08/2012	Nukus	Tashkent to Nukus afternoon visit to research area
09/08/2012	Nukus district	Visit to research and take soil and water samples
10/08/2012	Nukus and Chimbai district	
11/08/2012	Chimbai district	
12/08/2012	Chimbai and Nukus district	Conducted questionnaire survey from targeted farmers
21/09/2012		
26/09/2012	Tokyo	Tashkent to Narita

Prior to this study, investigation of major roles of farmers, maintaining soil fertility, availability of irrigation water and agricultural productivities of the selected districts in the Republic of Karakalpakstan. The main objectives of this research were to (i) assessment of water requirement for crops and water quality data on crops yield, soil`s requirements and production, (ii) determination of the impact of water quality as irrigation water for the main crops that cultivated in the area, (iii) development of recommendations for agro-ecological impact of the water quality to agriculture productions.

Uzbekistan`s economy depends heavily on agriculture, which accounted for 28 percent of GDP and employed 60 percent of the labor force in 2009. There are two main crops strategic significance for Uzbekistan: wheat for domestic consumption and cotton for export. With such a small percentage of land available for farming, the inadequate management of soils and years of irrigated agriculture intensification, without regard to the consumption of water or other natural resources, have had adverse environmental effects such as severe salinization, erosion and water logging of agricultural soils, which have reduced the land`s productivity. During the overseas field training had recognized lots of problem of Uzbekistan`s agricultural practices and policies in Uzbekistan need to be improved and modernized. Yields of irrigated cotton and especially wheat are low by world standards. There are several reasons for low productivity, including obsolete farm equipment and tillage practices; lack of availability and timely application of agricultural inputs; increasing soil salinity; unsustainable cotton-wheat crop rotation; poor weed control; a still imperfectly developed and structured cooperative farm system; and lack of research and knowledge on alternative crop rotations.

Findings and achievements obtained, significant experiences and lessons

This research was done in two districts (Chimbai and Nukus districts) of Karakalpakstan, Uzbekistan.

The study was mainly done through participatory approaches, which included discussions with stakeholders at various levels (governments, water cooperatives and local farmers). Data from the interviews and discussions indicate that the farmers average farm experiences is 14 years and farmers (42,1%) educational background are relatively high, since all farmers who answered are high school graduated or

more. The most popular reasons to start farmer business is <making profit>, while <contribution to the local economy development > and <supporting local people by creating jobs> are also the second popular reasons. <Suggestion from the government> is not popular reasons, according to their answers.

Land use, which is the major means of production, is mainly through inheritance (see table-1). Even though, average land area of farmers is 57,9 ha. Out of the land area occupies about 2/3 of the area. While almost irrigated area is used for farmland, no crops were planted in about 1/4 of the area (8,6) ha. Non-irrigated area mainly consists of salinity problems land, pasture/grazing land and fallow land.

Table 1
Land use of selected farmers

Land Use	Crop farmer		
	Average (ha)		
	Irrigated	Non-irrigated	Total
1 Farm land	39,9	5,9	45,8
2 Out of 1, planted in 2011	32,0	0.0	32,0
3 Out of 1, salinity problem land	4,5	2,0	6,5
4 Orchard/vineyard	0,0	0,0	0,0
5 Pasture/grazing land	0,0	6,9	0.0
6 Forest/woods	0,0	0,2	6,9
7 Housing compound	0,0	0,1	0,2
8 Other use & fallow	0,6	4,2	4,8
Total	40,6	17,3	57,9

Most of farmers claim that less irrigation water (100%) is the most serious reason of the existence of the unplanted farmland, and the second serious reasons salinity damage (77,2%) and financial problem (53,4). Some farmers also answered that they do not have experience about crop rotations (18,1%).

The major food crops in the areas include cotton, which is grown by 100% of farmers, winter wheat (89,7%) and rice (78,4%). A number of farmers have given up growing some crops for various reasons. Crops that were grown in the past are no longer being grown in the district. For example, the number of farmers growing rice has declined. Table 2 below is illustrative of this situation.

Table 3
Crop production of farmers

Crop	Crop Farmers					
	No. of farmer to grow	Average			Season	
		Planted area (ha)	Production (ton)	Yield (ton/ha)	Start (month)	Harvest (month)
1 Cotton	71	19,4	33,9	1,75	4-5	9-11
2 Wheat (winter)	74	13,3	17,6	1,33	9-11	6-7
3 Wheat (spring)	0	0,0	0,0	Na	Na	Na
4 Rice	69	7,0	15,0	2,14	5-6	10-11
5 Corn (grain)	34	2,0	1,5	0,75	5	10
6 Sorghum	58	2,8	2,4	0,85	4-7	9-11
7 Fodder crops	47	3,7	16,0	4,36	4-6	10
8 Melon & gourds	12	2,1	8,8	4,19	4-7	9-10
9 Tomato	28	0,5	5,0	10,00	5	9

Shortage of water and drought were the main reasons that were given for a low productivity in crops grown in the research areas. This reason supports arguments given earlier that the areas are drought prone and water scarcity is a major problems. Other reasons for a low productivity of crops include diseases and soil erosion. The majority of farmers irrigate their land and it is only through irrigation their land and it is only through irrigation that they can manage to produce enough crops. Through irrigation farmers are able to produce enough main crops. However observation indicated that most of the irrigation infrastructures are elementary with major source of water for irrigation being rivers. The dependence on rivers means that people are not informed about the risks they face from climate change and increased extraction upstream as very little water is available for irrigation during, especially dry season. These research clearly indicate that water shortage is a real and most serious problem facing the farmers in the research areas, especially for irrigators.

Achievements and future vision

Karakalpakstan, where I live, is well known for its ecological crisis, the result of irresponsible environmental practices. These practices were developed as part of the nation`s economic strategies. I am very concerned about my country and wanted to get a good education in Environment Management. Being a major of economics, I would like to ascend onto higher intellectual horizons by undertaking advanced studies at Tokyo University of Agriculture and Technology, which will enable me to fulfill my ambition of being an outstanding expert in Environmental Management. I hope I can contribute my knowledge and lifelong enthusiasm to the ongoing environmental management development of my homeland. The past twenty-five years which I was brought up has been the most sensational and significant age of Uzbekistan`s reform. This period witnessed the emergence of a prosperous new Uzbekistan, which I experienced personally and kept a close eye on, during which the occurrence and maturation of many new things in economy and environmental management have stimulated my strong interest towards these areas of study. Experience, which I had obtained from overseas field training, was one of the most valuable and significant experiences in my life. I will be able to apply my gathered knowledge and experiences to several organizations, which is relating to environmental and agricultural sciences such as environmental protection, water and soil research techniques. This field research provided me an excellent opportunity to work with outstanding scientists and allowed me to build relationships with them. After successful graduate of my Master Course, I will continue to collaborate not only with the expert scientists, but also with professors and young generations who are interesting to solve environmental issues. I will also make my knowledge available and give consultations to farmers and industries relating to suitable environmental management.

Acknowledgement

I am very thankful to my supervisor, Professor Yoshiko Kawabata of IEAS, TUAT, for her enormous support, inspiration and extraordinary guidance during my field research.

Also, I would like to thank to FOLENS program and FOLENS professors for their guidance and academic supports.

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Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Investigation of herbicide usage and consequent contamination in upland soil and surface water in Petchaburi Province of Thailand.

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Destination and period:Thailand, 8 August - 6 September 2012

Key words: herbicide, contamination, upland soil, surface water

Abstract

This study investigates an environmental impact which is influenced by herbicide used in agricultural land. The major focus is on the increase of herbicide usage and consequent contamination in surface water and soil in Petchaburi Province of Thailand. The interview to the local people indicated that 60 % of the population is engaged in agriculture and the rate of chemical fertilizers use was almost 100%. However some farmers are using chemical fertilizers with organic fertilizers. Farmers use organic fertilizer at the rate of 500 grams per acre to maximize productivity, during the rainy season from September to December. The weed growth was found to be associated with the use of herbicides most farmers use Grammoxone and Paraquat were herbicide used in the most of the area. Farmers use these herbicides of 1 liter per acre from March to August and apply 2 to 4 times in one month in the summer to rainy season. This study aims to investigate herbicide usage and consequent contamination of municipal primary treatment in order to consider about herbicide fate and transport in water and soil, for preventing or minimizing the problems and protecting the environment.

(1) Contents and activities during the overseas field training

Introduction

My overseas field training funded by the FOLENS program was carried out from 8 August to 6 September 2012 in cooperation with Dr. Kasem Chunkao and Dr. On-anong Phewnil at the College of Environment, Kasetsart University and The King's Royally Initiated Laem Phak Bia Environmental Research and Development Project (LERD) of Thailand. The idea of this project was brought from The King’s Royally

Initiated to local people including assessment of environmental impact which influences on agricultural land. The impact may lead to an inability to sustain food production, soil, water and the health of local residents in the future. To study the agricultural community and farming use of chemicals in the farming community, this study aims the investigation of herbicide usage and consequent contamination of municipal primary treatment in order to consider about herbicide fate and transport in water and soil, for preventing or minimizing the problems and protecting the environment and before the problem occurs with the health of people in communities around the area.

Study area and Materials

In the first week we were introduced to the location and organization of the research unit. The first training was to go to the field survey and see local people for interview in study area in Petchaburi Province of Thailand as shown figure1. There are 134 households in the study area (Data from Phusawan Subdistrict Administrative Organization), Petchaburi Province of Thailand. We have carried out interview inquiries with 75 households, representing 55.97 percent of the total.

Figure 1. Local people interview

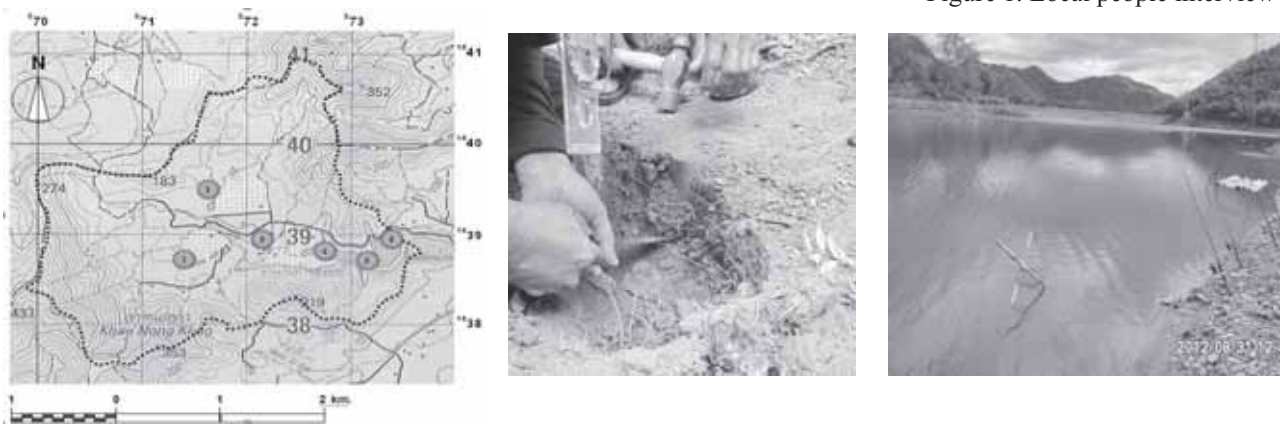

Figure 2. Map of the study and the monitoring soil and water samples

HPLC Method

During the second monitoring soil and water samples were collected where herbicide have been applied in the upland area. The samples were collected in six positions upstream and downstream as shown figure 2. During the final was a laboratory analysis period for contamination in surface water and soil as shown figure 3. In addition, I was trained in the use of High Performance Liquid Chromatography (HPLC) SP930D, UV-Detector autochro-3000 and HPLC column vertisep UPS C18, 4.6x 50 mm.3um.

Figure 3. Laboratory analysis

Local herbicides used

This overseas field training gave me an opportunity to share and exchange knowledge and ideas

about environmental issues with scientific experts. From these experiences and practices I learnt more about perspectives and the wider research community. In this study, the results and findings of the field survey indicated from the local people interview for characterizing the main occupation of the population in the area as shown Table 1 and 60 % of the population is engaged in agricultural sector and the rate of herbicides use was almost 100%. However some farmers are using fertilizers with organic fertilizers. In terms of volume, the use of fertilizers by farmers. Farmers use fertilizer at the rate of 500 grams per acre per month to maximize productivity, normally will be used the rainy season from September to December. The weed was found to be associated with the use of herbicides. Most farmers use Grammoxone and Paraquat were herbicide used the most in this area as shown Figure 4. Farmers use these herbicide of 1 liter in volume per acre from March to August for 2 to 4 times per month in the summer to rainy season.

Table 1: Characterize the main occupation of the population in the area

No	The main occupation	Number	Percentage
1	Not employed	1	1.33
2	Agriculture/Crop	30	40
3	Employed in the agricultural sector	17	22.67
4	Animals	1	1.33
5	Employment outside the agricultural	13	17.33
6	Trade	12	16
7	Government/State	1	1.33
	Total	**75**	**100**

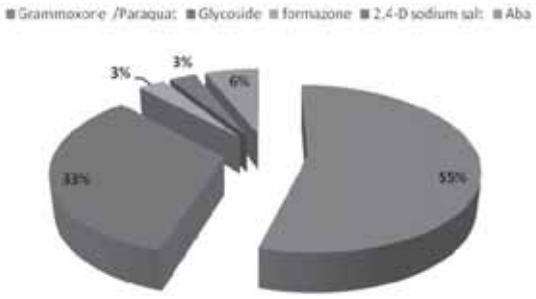

Figure 4: The use of herbicides in agriculture.

This project was derived from the observations in the study area that preliminary data the use of herbicide in the area. Water and soil samples in upland area the herbicide have been applied were used for the monitoring. The physical properties of water were as follows, total suspended solid was 10.12 mg/L, total solid was 249 mg/L, chemical oxygen demand (COD) was 15.94 mg/L, biochemical oxygen demand (BOD) was 1.93 mg/L, alkalinity was 200.07 mg/L$CaCO_3$ and hardness was 155.87 mg/L of surface water samples collected from the depth of 30 cm the completed. The study is to investigate the combined environmental impact which increases in an agricultural land. In order to consider about pesticide fate and transport in water and soil. I also studied about the consequent contamination in soil. Lastly I wish to use my all experience to solve environmental pollution and related issues for preventing or minimizing the problems and protecting the environment. In order to be a good Field-Oriented Leaders in Environmental sectors my experiences and field practices in Thailand will play an important role to let me gain the deep understanding the environmental impact which is influenced by herbicide used in agricultural land and to develop the limited natural resources and to maintain the environment. Moreover learning culture, tradition, improving skills both public and private sectors are also one of the important parts for my purpose in this overseas field training. Another important problem concerns the environment. The matter on contaminants in water and soil has been studied. Solutions are not difficult. There is technology to do the job. It can be done in Thailand. Finally I could use my experiences to solve environmental pollution impact from herbicide usage and consequent contamination in water and soil, which influenced by agriculture land and related issues for preventing or minimizing the problems and protecting the environment. This overseas field training allowed

me to experience being both a leader and a follower, which are important qualities for a community- and field-oriented leader in the environmental sector.

(3) Achievements and its future vision.

The experience I had during this overseas field training was one of the most important and meaningful experiences in my life. I will be able to apply the knowledge and ideas from this internship to several academic classes, especially in a program of environmental and agricultural sciences such as plant response to environmental issues, consequent contamination in surface water and soil, and research techniques. This overseas field training provided me with improving skills both public and private sectors to work with outstanding scientists and allowed me to build relationships with them. I learnt that considering several points of views, literature reviews, and careful thought are important for conducting research. After I graduate, I will continue to collaborate not only with the expert scientists I met in this trip, but also with professors, instructors, and students in the FOLENS program to conduct high-impact research with the aims of solving global environmental issues and enhancing water quality as a field-oriented leader in the international community. This would support local people and international researchers by providing information on environmental issues in local communities, as well persuading local people to become more concerned about environmental issues and pesticide fate and transport into water and soil. I will try to lead the new generation to become environmentalists in the future. I will also make my knowledge available and give consultations to farmers and industries relating to suitable environmental management.

(4) Acknowledgement

The greater part of this overseas field training was supported by my supervisor in Japan, Professor Hirozumi Watanabe; Dr. Kasem Chunkao and Dr. On-anong Phewnil at the College of Environment, Kasetsart University and The King's Royally Initiated Laem Phak Bia Environmental Research and Development Project (LERD) of Thailand and FOLENS program of Japan.

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(Supervised by Professor Hirozumi Watanabe)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

The environmental impacts and the future of industrial crop production in Ghana

Shogo Shimada
M1, Applied Chemistry, Engineering department
Destination and period: Ghana, Accra, 12 -26 August, 2012

Key words: Industrial crops, Palm, Cassava, Jatropha, Cocoa

Abstract (approximately 200 words)

The main objective was to investigate the environmental impacts of some industrial crops in Ghana and assess the potential production problems and benefits through questionnaires, site surveys and acquisition of information from some research institutes and other governmental organizations. We successfully carried out the surveys and gathered information from many organizations such as JIRCAS, Juaben Oil Mills Limited, Kwame Nkrumah University of Science and Technology. Also, we investigated the constituents of Akpeteshie. Akpeteshie is one of the common locally produced spirits in West Africa. It is the product of distilled palm wine which has been fermented over a long period of time. It is widely believed among the local people that drinking the initially distilled Akpeteshie can cause sore throat, inflammation of the stomach linings or even cause death. For this reason, the traditional producers try a long process of redistilling it over several hours before obtaining a relatively safer product. The process is not only time-consuming but it also requires a huge amount of fuel which usually comes from firewood. Although this belief presupposes that Akpeteshie might contain harmful chemicals such as organic acids, it is also possible that it might contain chemicals that may be industrially useful. Samples of Akpeteshie were collected from different locations in the Eastern, Central and Ashanti regions of Ghana and transported to Japan for analysis. By this field training, I have learned that many problems cannot be figured out without being on the field. The way of planning and implementing projects is different for different countries due to differences in socio-cultural values and behavior. For example, things are planned according to schedule in Japan but in Ghana so many factors usually prevent projects from being completed according to plan.

(1) Contents and activities during the overseas field training (less than 600 words)

Title of your Overseas Field Training (filled in the proposal form):

The environmental impacts and the future of industrial crop production in Ghana

Names of the counterparts:

University of Ghana, Kwame Nkrumah University of Science and Technology, Cocoa research institute of Ghana, Ghana Oil Palm Development Company, Japan International Research Centre for Agricultural Science,

Professors:

Prof. John Ofosu-Anim, Dr. Edward Benjamin Sabi, and Prof. Samuel Nii Odai

Training content

To carry out research on the environmental impacts of the selected industrial crops, we visited small and large-scale private producing sites and national sites to see the field and do some questionnaires surveys on the basis of which we can then compare the kinds of environmental problems. Also, we visited and learned about the Cocoa producing sites and made a comparative analysis with the other industrial crops. We visited the Ministry of Agriculture/Energy and JIRCAS to obtain information on the current production trends in the selected industrial crops.

For the research on palm tree waste, we visited several akpeteshie producing sites in three regions and collected samples (Three 4cc sample bins for each region) to do qualitative analysis in Japan. We also tried to collect samples of akpeteshie produced from two kinds of palm species (oil palm and raffia palm). Also, the production processes were slightly different for different regions thus it may affect the results.

The reason why we focused on palm tree waste was clear. They might contain harmful substances. This idea come from the rumour has it that people who often drink akpeteshie die very early. Also, it is well known that when people drink akpeteshie they feel irritated at their throat. So we wanted to make sure that akpeteshie is harmful and people stop drinking it. We did not know what kind of constituents in akpeteshie, but we believe they must contain methanol or some kind of carboxylic acids. If they contain methanol, LDL0 of methanol is 3429 mg/kg and for less amount of methanol cause nerve damage, sometimes people become blind too.

Fig. 1 Akpeteshie distillation

Fig.1 shows how the distillation system works. The bottles are the tray for akpeteshie that have been distilled. We collected the samples at the outlet of the distillation systems.

Fig. 2 The forest of palm trees

Fig.2 shows the forest of the palm trees around the biggest palm oil production factory. The company does not make akpeteshie, instead they have burned whole forest because the productivity of palm oil would be reduced with 40 year old palm trees. This is waste of bio energy and this is not good for the land either.

Therefore suggesting palm as bio fuel is urgent for the perspective of environmental conservation too.

Then, specify environmental issues in the area, its relation to local society, their lifestyle, your field training content and Japan's stand point are to be mentioned.

From the questionnaires I could conclude at the moment that farmers do not really care whether their methods of farming are actually sustainable or not. Most of their interest is about the money, and not about the impacts their practices have on the environment. Since their educational levels are low, first thing we should approach is to provide education for overcoming their financial issues to let them take into account about the environment. On the other hand, Cocoa research institute are working on how to integrate agroforestry into cocoa farms and other crops. Agroforestry can provide sustainable land and produce various crops. Popularization of these agroforestry systems may resolve the environmental problems they face in future.

The environmental issues in Ghana are not only sustainability of farming. For instance, polluted soil due to heavy metals from gold mining, soil erosion, discarded solid waste, and contaminated water are the obvious environmental issues in Ghana. At most of the places we visited, people talked about the destruction of forests for gold mining activities as the main cause of heavy metal pollution.

Lack of jobs was one of the topics they talked about together with the problem of gold mining. They mentioned that most foreigners involved in small-scale gold mining activities were Chinese. So gold mining does not really create jobs but destroys the environment. Gold mining is not the only job problem they have, Chinese employees also carry out the construction of the roads instead of local labor.

These problems are not only the environmental problems but also social problems and causing conflict between Chinese and Ghanaians.

On the other hand, there are many problems that they do not recognize. As I mentioned earlier, that is water and solid waste. I could see that Ghanaian people dispose of solid waste at landfills. I could observe that they were not treating wastewater from toilets. As nobody mentioned about it in my interviews, it could mean that they do not have an understanding of how those waste problems affect their lives. Not treating them causes environmental issue as well as cause diseases.

What I can say about these issues for Japan is they need to educate people to understand the importance of waste management as well as constructing the infrastructure. I assume this kind of project is already done by many NGOs and other organizations. But they are not contributing enough so some enhancement would be required for significant impact to be made.

Moreover, I think an initiative to stop heavy metal pollution is urgent. Historically, Japan knows what kind of problems occur if such situation continues. So Japan must make campaign about this issue globally, as well as educating doctors for countermeasure for the diseases.

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

How you make the experience practical to your master or doctor course study as a field-oriented leader in environmental sectors in Asia and Africa.

My master course study is development of a microreactor for methanol steam reforming. The microreactor is designed to be used as part of a mobile fuel cell. Thus my interest during the field-training was on energy issues, more precisely electricity generation.

During my stay in Ghana, I felt that Ghana has a very serious problem with stable supply of electricity. The electricity easily shuts down and would not recover for a whole day or more. It was clear that infrastructure for electricity was not constructed very well. It probably will take a long time to solve this kind of problem. With the present condition, civilians use their own generator to produce electricity for running their businesses such as restaurants, hotels, etc. Yet, since generators use petroleum, the price of the fuel affects their livelihood. Therefore there is the need to conduct research for less dependency on petroleum.

From this investigation, I recognized that a stable supply of biofuel is possible as there are many kinds of resources that can be used for biofuel in Ghana. However, high concentrated biofuel is required for combustion engines, so it is difficult to be used with the conventional generators. The alternative suggestion is to use fuel cells. Fuel cells only require low concentration of biofuel.

For such reason, I think the application of my research might be suitable for the electricity generator in countries like Ghana where they do not have a stable supply of electricity and have potential to produce biofuels. In that case, I must design the reactor to be very cost friendly with high output.

Also, as it was mentioned before, even though Akpeteshie may contain harmful constituents, any kind of hydrocarbon can be used for steam reforming to obtain hydrogen. Thus commercializing the Akpeteshie as a fuel for fuel cell can provide a solution to the energy problems and discourage people from consuming it, thereby reducing the health risks it poses.

So I looked for the equipment that can measure what is the constituent and how much it is. My solution was to use MS at the analysis instrument centre at Koganei campus. Yet, Dr.Agyeman suggested me to ask for Prof.Takada because he could analyze the sample too. Since I was not very sure how to use MS and we did not have a lot of sample (which means we cannot miss) I took up Dr.Agyeman’s suggestion. At the moment we do not have the results yet.

Give us good points and suggestions how can overseas field training be much better one from your actual experiences.

Being on the field and talking with people there, understanding the culture of the country and languages may help us to communicate with local people. I learned about some culture by reading some books and they were pretty useful, but I think I should have read about current affairs as well. I did not know about how Chinese companies were causing environment problems in Ghana.

(3) Achievements and its future vision (less than 400 words)

How can you apply the achievements, lessons and what you learned to your future vision and career as a field-oriented leader in environmental sectors? How does your future vision contribute to environmental problems and international cooperation?

Visiting Ghana gave me an impression that they have more potential to develop than I thought. I would like to contribute to their development through business. I would probably be working for a chemical

related industry in future. So there is a high possibility for me to work in Ghana since they have oil reserves. However, I recognized there are many social problems that Ghana needs to overcome before the development.

In Ghana I could see a huge gap in lifestyles between urban people and rural people. A clear fact that gives you an idea of the difference is that urban people refuse to eat meals prepared in rural areas. Most of the TV shows or books only talk about the country side, but the urban cities are quite developed and you could see state-of-the-art smart phones, cars etc. This means there are people who have enough money to buy these items. I would say encouraging this group of people to contribute their country would be necessary for the development of the country.

Moreover, regulations for environmental issues are not working at all. It is already common sense that gold mining companies are polluting the land by heavy metals but no actions are taken.

As an engineer, I do not want to pollute like this even though the regulation is not working. So my vision in future is to be an engineer who can consider about the pollution.

About the akpeteshie, we will show the results of the analysis at the presentation. We believe it must contain harmful constituents and we hope people in Africa (Ghana is not the only country that drinks akpeteshie) will stop drinking harmful drinks by recognizing the results. We have collected several kind of akpeteshie(different region, different way of distillation etc), so they might contain different constituents. Maybe some of them have something useful for the industrial use. Also, we know that same palm tree waste was used as bio fuel in Malaysia. Thus we hope people will start to use palm tree as the fuel but not for the drink.

(4) Acknowledgement

Prof. John Ofosu-Anim, Dr. Edward Benjamin Sabi, and Prof. Samuel Nii Odai

(5) References

(Supervised by Dr.Agyeman)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Sediment core sampling in South Arica

Maki Ito
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Graduate School of Agriculture

Destination and period: Durban, South Africa, 1-10th September 2012

Key words: Marine pollution, POPs, Sediment core

Abstract (approximately 200 words)

The objective of this training was to collect sediment cores in Durban, South Africa, to investigate marine pollution by POPs. We worked in scientific collaborations with the Council for Scientific and Industrial Research(CSIR) in Durban. Core sampling was carried out with the CSIR staff members and it was completed very successfully. Three core samples were collected in Durban Bay and two in Isipingo Bay. The analytical results of the cores are expected to give us important information about the pollution sources when they are compared with results of plastic resin pellets and air samples from Durban. On the other hand, we were confronted with discrimination problems during this training in South Africa. Some areas like slums did not allow us to enter because its public security was not good enough. However, those areas are a possible source of pollution so we should not leave behind these problems. In the future, I would like to change this kind of discriminated people's lifestyle to a healthier and safer one for everyone.

(1) Contents and activities during the overseas field training

My main objective was 'sediment core' sampling in South Africa to investigate marine pollution by persistent organic pollutants (POPs).

One of the reasons we were interested in South Africa was because of the limited information about pollution in South Africa. Before this training, plastic resin pellets which were collected near Isipingo Bay were analyzed to estimate its pollution state by POPs. As a result, we detected some POPs in the pellets and the level of *gamma*-HCH was higher than any other country's. *Gamma*-HCH has been used worldwide as an insecticide called "lindane" since the 1950s. In addition to the results of the pellets, high level of

gamma-HCH pollution was reported in the vapor phase of the air in Durban in 2008 (Batterman *et al.*, 2008). Also, we collected vapor phase pollutants by using polyurethane foam (PUF) disks in Durban in 2011, and found relatively high levels of *gamma*-HCH compared with other countries. It can be said that there is a possibility of local use of "lindane" at several farms. Therefore, it is necessary to get and analyze sediment core samples to estimate the possible residue of contamination and its time trend. The sediment core sample will provide us the time trend of emission of pollutants.

Our counterpart was the Council for Scientific and Industrial Research (CSIR) in Durban, South Africa. Because Professor Hideshige TAKADA has good connections with them through the International Pellet Watch (IPW) project, which is global monitoring POPs using beached plastic resin pellets (Ogata *et al.*, 2009), we were able to obtain scientific collaboration with them this time. We went to Durban Bay on September 6th and Isipingo Bay on September 7th to get some cores. CSIR staff members prepared the rubber boat for us and we used a corer from the boat to get sediment cores (Fig. 1). We succeeded in getting almost 50cm cores (Fig. 2). After taking the sediment core, it was brought to the land. Then, it was cut into 2.5cm pieces and stored in stainless Tupperware containers. Since this process cannot be managed by one person, so a few members of the CSIR staff and our laboratory members worked on it together.

Finally we succeeded in getting three core samples in Durban Bay and two in Isipingo Bay.

Many pellets from Isipingo and Durban Beaches were also collected to determine their level of contamination.

Fig. 1 Sediment core sampling at Durban Bay

Fig.2 Slicing core sample with CSIR staff

(2) Findings and achievements obtained, significant experiences and lessons

We had an opportunity to give presentations of our study by posters(Fig.3) and oral presentation(Fig.4). The main topic of the oral presentation was about *gamma*-HCH concentration in pellets and how to estimate its source. We expected to be able to estimate the source of HCHs by comparing it with the analytical results of sediment core samples. The audience asked us many questions, especially about the source of HCHs. Then, the next morning, the results of our study appeared on the first page of a local newspaper (Fig.5) because a journalist was there. This episode showed us their great concern about

environmental problems. And I learned the importance of preparation in advanced to anticipate topics for discussion with them. For example, the analysis data which was obtained prior to this training provided us the main points we needed to implement discussion with the local people. I learned that suitable data makes for smoother communication.

Therefore, I again realized the importance of taking the responsibility for our study. The reports of environmental pollution problems could sometimes have an influence on society or the world. Thus, the way of reporting should be carefully considered in order not to cause confusion.

Fig.5 Result of pellets was picked up by newspaper

For my master's degree, I am planning to analyze the core samples. When getting results, I have to announce them immediately but should be careful not to cause misunderstandings or confusion. There is not only one way to report a result, so we should choose a style depending on the knowledge and background of those cooperating with us.


Fig.3 Poster presentation of our studies


Fig.4 Oral presentation

(3) Achievements and its future vision

It was a very useful experience to be able to communicate and discuss our studies with foreign people who have different backgrounds. And also our sediment core samplings were successful thanks to them.

However, we were confronted with discrimination problems during this training in South Africa. There is still racial discrimination even though apartheid was done away with in 1991. For example, we had planned to get groundwater from a local well for another sampling member at the beginning, but the CSIR staff did not know where the wells were because they were white men and/or from the upper class in South Africa (Fig.6) so they had never used them. Therefore, there was the possibility of the existence of wells in "the areas they had never been." It means the areas where the poor black people mainly live and are regarded as not safe for upper class people. (Fig.7) Thus, this could be acknowledged unfortunately as a trace of separating the residential space between whites and non-whites as it existed during apartheid. In addition, due to poor public security, we could not go and see the real lifestyle in the slum areas, and we were warned

that public security was not good enough to allow us to go into such places. However those slums are a possible source of some pollution. This problem should not be overlooked when solving environmental problems. In the future, if possible, I would like to change this kind of discriminated people's lifestyle to a much healthier and safer one.

Furthermore, I believe one of the ways to solve this problem is education. More help should be given to local children to give them proper education. Hopefully, removing discrimination from South Africa will be accomplished more quickly and radically, and in so doing, we will be able to accomplish further and even more worthwhile research.

Fig.6 The view of developed houses and road

Fig.7 The view of slum area

(4) Acknowledgement

We wish to express our special thanks to The Council for Scientific and Industrial Research in supporting my training. In addition, we also appreciate the Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa for its financial support.

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(Supervised by Hideshige TAKADA)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

IMPACT OF DOMESTIC AND INDUSTRIAL WASTE MANAGEMENT ON WATER ENVIRONMENT IN THE MEKONG RIVER DELTA, VIETNAM

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Oversea field training in Vietnam from September 3-16, 2012

Key words: domestic wastewater, industrial wastewater, water pollution, Mekong River Delta

Abstract

It was our great oppotunity to have an overseas field training in Vietnam in 2 weeks in September 2012, which we had learnt knowledge about industrial wastewater treatment and management, the impact of domestic and industrial wastewater on surface water quality in the Mekong River as well as some particular visits for experience the impacts of human on natural resources and environment. Many study sites in Can Tho city and Thua Thien Hue province, including factories in Tra Noc Industrial zone, O Mon landfill, farmers in Hoa An village, Can Tho University, and Bach Ma National Park have been visited. The results showed that wastewater in seafood processing factories in Tra Noc Industrial Zone, including before and after treated by wastewater treatment systems had high level of nitrogen, phosphate, organic matter, *E. coli* and coliform which were far above the Vietnamese standard for industrial wastewater (QCVN11: 2008/BTNMT). Water pollution indicating parameters of COD, NH_4^+, and EC in the branches of Hau River water at Can Tho city were much higher than the limit by Vietnamese standard for surface water quality (QCVN08:2008/BTNMT). It was calculated that every year Can Tho city has discharged into Hau river 1.2-8.2x10^7kgCOD.year^{-1} or 5.5x10^7kgCOD.year^{-1} averagely, in which domestic wastewater was 0.63-1.9x10^7kgCOD.year^{-1}, and from industrial wastewater was 0.6-6.2x10^7kgCOD.year^{-1}. Moreover, we also learned about the integrated farming system called VACB as one of the popular farming systems in the Mekong Delta which contribute to increasing farmer's income and environmental protection. Additionally, visiting O Mon landfill was a great chance for us to experience the situation of solid waste management in Can Tho city, where we could experience the impacts of poor management landfill on local community and surrounding environment. Finally, a visit to Bach Ma National Park and charcoal project (supported by TUAT) in the buffer zone have clarified us another aspect of human impact on natural resouses conservation as well as understanding the activities of the charcoal project, which can be considered as a potentially

effective solutions for improving livelihood of local people in buffer zone and reducing the pressure of human impact on protection of natural reserve area.

(1) Contents and activities during the overseas field training

My overseas field training was focused on the impact of domestic and industrial waste on water environment in the Mekong River Delta of Vietnam, which was carried out in Vietnam from 03/09/2012 to 16/09/2012 under supervision of Assoc. Prof. Tarao Mitsunori, Assis. Prof. Ozaki Hirokazu, FOLENS, TUAT and some supports by College of Environment and Natural Resources, Can Tho university, Vietnam. Folowings are the main study topics of my training:

Topic 1: Investigation on the quality of wastewater from fish processing factories in the Mekong Delta

The procedure of processing the aquaculture products in the Mekong Delta, where occupied more than 80% of aquaculture production of Vietnam, have generated large amount of wastewater which contains high amount of pollutants such as organic compounds, nitrogen, and phosphate, and pathogen as well. Wastewater from those processing factories was only partly treated or completely untreated, and was discharged into natural water bodies, which may easily cause eutrophication in the receiving water bodies and negatively impact to public's health. Therefore, my master study on constructing a wastewater treatment system for removal of nutrients of seafood processing industry based on biological processes has been investigated. For appropriate designing the treatment system, the characteristics of wastewater discharged from fish processing factories in the Mekong Delta was studied in this overseas field training. Therefore, wastewater from two fish processing factories in Tra Noc Industrial Zone at Can Tho city, namely Mekong Factory, and Quang Minh Seafood Factory were collected in 3 days continuously to survey the pollutant levels of that wastewater. Specifically, raw wastewater samples (input) and treated water (output) by the wastewater treatment plant in fish processing companies. Besides, the wastewater samples in drainage of the industrial zone which received the effluents from surrounding factories, including surveyed fish processing companies were also taken. The samples were carried to the Laboratory of Environmental quality in Can Tho University for analyzing the characters including pH, electrical conductivity (EC), total nitrogen (TN), total phosphate (TP), total organic carbon (TOC), total coliform, *Escherichia coli*, and heterotrophic bacteria density. Sample analyses were done according to standard methods for the examination of water and wastewater (APHA, 2000).

Topic 2: Impact of domestic and industrial wastewater on water quality of the Mekong River at Can Tho city

It has been known that due to weakness in wastewater management in the Mekong Delta region, domestic and industrial wastewater of this area has seriously polluted the Mekong River. This study was carried out to assess the impact of domestic and industrial wastewater on the water quality of Hau River at Can Tho city (DONRE of Can Tho city, 2009). For this purpose, water samples were collected from 3 sites at the mainstreams (O Mon, Ninh Kieu, and Cai Con) and 3 sites of its branches in Can Tho city (Tham Tuong, Cai Khe, and Sang Trang) which were affected by domestic and industrial wastewater (Figure 4).

Additionally, wastewater samples from 10 households and 4 drainages in Tra Noc industrial zone were also collected for estimation of total pollution load of the city. Beside assessment the impact of domestic and industrial wastewater on the surface water quality, calculation pollutant load by domestic and industrial wastewater in Can Tho city has been included in this study. Analyzed parameters were wastewater water temperature, flow rate, pH, EC, chemical oxygen demand (COD), Cl^-, SO_4^{2-}, NO_3^-, Na^+ and NH_4^+. Physical and chemicals parameters were analyzed according to standard methods for the examination of water and wastewater (APHA, 2000).

Topic 3: ***Study at the integrated VACB farming system in Hoa An commune, Hau Giang province***

We have visited farmers in Hoa An commune, Hau Giang province, where applied the integrated farming system of VACB, i.e. vegetable planting, aquaculture, livestock, and biogas generation system, which have been practicing popularly in the Mekong Delta. By this opportunity, we have learnt the current agricultural practices of farmers in this region, strategies of farmers in facing challenges of farming in acidic soil and finding appropriate farming systems with low capital investment as well as improving hygienic condition in their farm by applying the VACB.

Topic 4: O Mon landfill – a case study of solid waste management

O Mon landfill is an open landfill in Can Tho city, which closely surrounded by rice fields and high density of population. A survey at this landfill has been carried out to experience the situation of solid waste management in Can Tho city and learn the impacts of poor management landfill on local community and surrounding environment.

Topic 5: Visit Bach Ma National Park and charcoal project by TUAT in the buffer zone

The Bach Ma national park in Thua Thien Hue Provinve, as well as many other conservation area in Vietnam are commonly under challenge of illegal exploitation by poor people in the buffer zone. Therefore, we have visited Bach Ma National Park and charcoal project carried out by Tokyo University of Agriculture and Technology in Khe Su hamlet, a buffer area of the national park in order to learn about the human impact on natural resouse conservation and understand the activities of the charcoal project as a potentially effective solution for improving livelihood of local people in buffer zone and reducing pressure of human impact in natural reserve area.

(2) Findings and achievements obtained, significant experiences and lessons

Knowledge and data gained from this overseas field training are especially important to my master research on wastewater treatment system and my future career. I am a student from Vietnam, therefore environmental issues in Vietnam seems very familiar for me. However, this overseas field training has provided me a great opportunity to understand more about environmental issues in my region much more than before. We have visited many study sites that I have not experienced before such as wastewater treatment systems of fish processing factories, landfill, Bach Ma National park, where I could talk to many

people and learn about environmental issues in Vietnam from different viewpoints, particularly the wastewater treatment technology and waste management, water pollution in the Mekong Delta, environmental friendly farming systems as well as experienced the activities of community development and natural resource conservation project.

Followings are significant results of my overseas field training:

Topic 1: Investigation on the quality of wastewater from fish processing factories in Tra Noc Industrial zone, Can Tho city

The procedure of aquaculture products processing has generated large amount of wastewater which contains high amount of organic materials, nitrogen, and phosphate, and pathogens have polluted the surrounding environment, particularly water environment (Pham et al., 2010). Wastewater from those processing factories which is only partly treated (i.e. only a small portion of organic matter is removed) or completely untreated, and discharged into natural water bodies has been in considerable concern of public as it may easily cause eutrophication in the receiving water bodies and negatively impact to public's health. For that reason, appropriate designing an effective waste treatment system to remove the nitrogen and phosphate in wastewater from the factories, good understanding the characteristics of wastewater discharged from fish processing factories for set up wastewater treatment system is needed.

The study was carried out in the two factories in Tra Noc Industrial Zone, namely Mekong Factory and Quang Minh Seafood Factory. Both of the two companies were processing catfish and seafood products, which processing capacity from 70 to 100tons/day. The wastewater generated from each factory was from 350 to 400m3/day. Those wastewater has been treated by wastewater treatment systems of the factories. In order to clarify to what extent the wastewater has been treated, raw wastewater samples (input) and treated water (output) by the wastewater treatment plant in fish processing companies as well as the wastewater in drainage of the industrial zone which received the effluents from surrounding factories, including surveyed fish processing companies were also taken.

Surveyed results of some physical and chemical characters of the influent wastewater and treated water are shown in figure 1 and 2. Figure 1, it is clear that pH of the influents and effluents was neutral, from 6.5 to 7.8. EC value in the influent wastewater of the wastewater treatment plants in the Mekong company and Quang Minh company were not considerably different, averagely 2339.5µS/cm. While EC in effluent waters of the 3 samplings sites, including 2 factories and the industrial drainage, is at 1318.8µS/cm. Specially EC value in effluent is highest in treatment system in Mekong factory, at 2223.3µS/cm, while that of Quang Minh factory was lowest, at 719.7µS/cm.

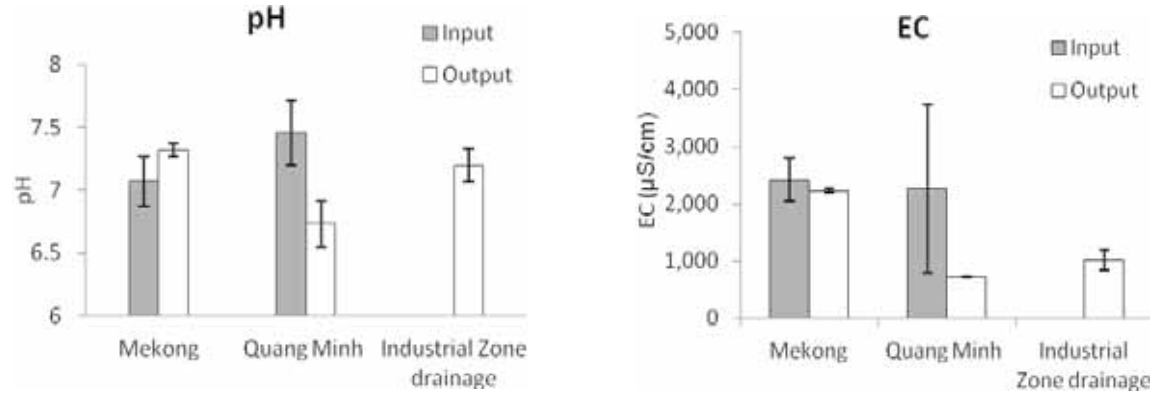

Figure 1: pH and EC in influent and effluent of wastewater treatments systems in fish processing factories and drainage systems in Tra Noc industrial zone, Can Tho city, Vietnam

Figure 2 shows that there were significant difference of TN, TP, and TOC concentration between influents and effluents of the companies and those values varied between the effluents of two companies and industrial drainages. The average TN, TP and TOC in the influents of the fish processing factories was respectively 1202.3mg/L, 362.5mg/L, and 2912.4mg/L. Those values of the effluent water were in accordance at 125.8mg/L, 85.5mg/L, and 116.8mg/L. It can be seen that even though wastewater has been treated by the wastewater treatment system of the factories, the effluent waters remained high concentration of nitrogen, phosphate, and organic matter, which was far above the Vietnamese standard for industrial wastewater (QCVN11:2008/BTNMT, class A) and regulation for industrial wastewater (QCVN 40:2011/BTNMT, class A)

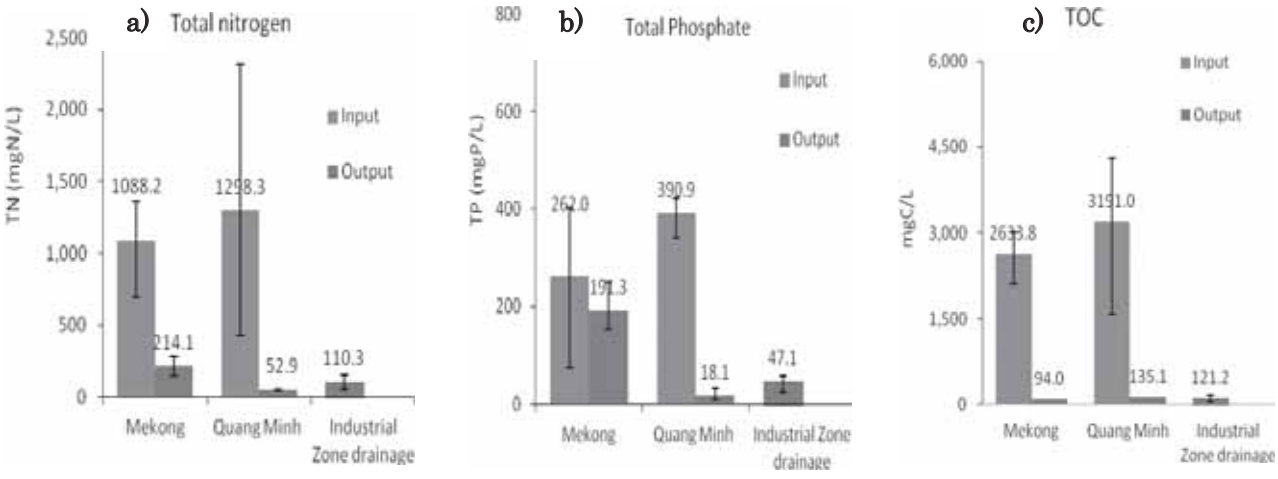

Figure 2: Concentration of (a) total nitrogen, (b) total phosphate, and (c) total organic carbon in influent and effluent of wastewater treatments systems in fish processing factories and drainage systems in Tra Noc industrial zone, Can Tho city, Vietnam.

The national technical regulation for aquatic products processing industry (QCVN11:2008/BTNMT) define the class C2 for industrial wastewater defines the maximum concentration allowed in the wastewater

of seafood processing industry which can be discharged into the water body used for water supply purposes (class A) define the TN and COD is 30mg/L and 50mg/L. According to Metcalf et al. (2003), typical values for the ratio of COD/TOC for untreated municipal wastewater are in the range from 2.5 to 4.0, while that value for treated water is from 1.5 to 2.0. It implies that TOC value is usually lower than COD value. While in national regulation for industrial wastewater in Vietnam (QCVN 40:2011/BTNMT), the maximum allowed concentration of TN, TP, and COD of industrial wastewater which can be discharged into the water body used for water supply purposes (class A) is respectively 20mg/L, 4mg/L, and 75mg/L. Therefore, it is clear that the average concentration of nitrogen, phosphate and organic matter remained in the effluent waters of the surveyed fish processing factories were much higher than the regulations, particularly higher than limit values in QCVN 40:2011/BTNMT more than 6 times, 20 times, and 2 times, respectively.

Although this drainage system is a collecting wastewater after the treatment system of not only from the surveyed factories but also from the nearby factories, samples of wastewater in industrial drainage system indicated that the wastewater from Tra Noc industrial zone generally has high concentration of nitrogen, phosphate and organic matter, at TN 110.3mg/L, TP 47mg/L, and TOC 121.2mg/L averagely, which were much higher than standard for fish processing wastewater in QCVN11:2008/BTNMT.

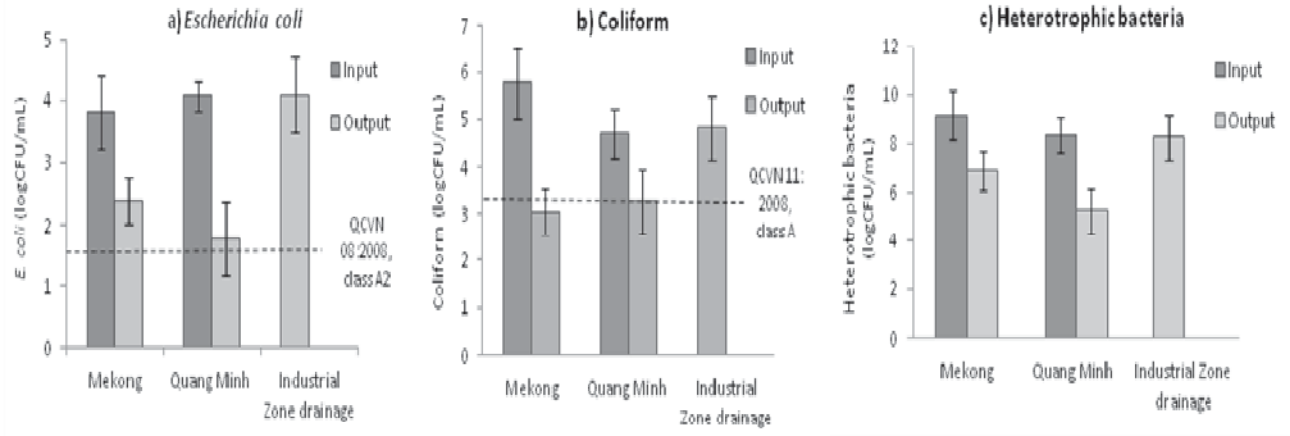

Figure 3: Density of (a) *Escherichia coli*, (b) coliform, and (c) heterotrophic bacteria in influent and effluent of wastewater treatments systems in fish processing factories and drainage systems in Tra Noc industrial zone, Can Tho city, Vietnam.

The density of *Escherichia coli,* coliform, and heterotrophic bacteria in influent and effluent of wastewater treatments systems in fish processing factories and drainage systems were shown in figure 3. Coliform bacteria are a commonly used bacterial indicator of sanitary quality of foods and water, and their presence is used to indicate that other pathogenic organisms of fecal origin may be present. While Escherichia coli, a genera of fecal coliform, is almost exclusively of fecal origin and their presence is thus an effective confirmation of fecal contamination. It can be seen from figure 3 that there was significant reduction of *E. coli,* coliform density in influent than in effluent waters. While the average density of coliform in the raw wastewater of the two factories were $0.9x10^4$CFU/mL ($1.1x10^4$CFU/mL from Mekong factory and $0.6x10^4$CFU/mL from Quang Minh factory), those values in the effluent waters decreased to $1.5x10^2$CFU/mL ($2.41x10^2$CFU/mL and $0.59x10^2$CFU/mL from Mekong and Quang Minh factory respectively). The density of coliform in the drainage system of the industrial zone, which received the

output effluents from several factories, including surveyed factories and discharged into Hau river, was much higher than the values of effluent from the factories, at $1.2x10^4$CFU/mL. This figure was also much higher than the allowed value in the standard in QCVN11:2008/BTNMT and QCVN08:2008/BTNMT.

QCVN11:2008/BTNMT, class A defines coliform values for seafood product processing wastewater discharging into river which used for water supply sources is $3x10^3$MPN/100mL. Besides, QCVN08:2008/BTNMT, technical regulation for surface water quality in Vietnam, defines coliform density for surface water used for aquatic animal and plant resources protection (Class A2) is $5x10^3$MPN/100mL According to Cho et al. (2010) in a study on comparison of coliform identification by colony-forming unit method (CFU) and most probable number method (MPN) of fecal indicator bacteria, the results of CFU method is almost equal to MPN method. Therefore, these surveyed data reveals that the coliform density in effluent waters after the wastewater treatment system in the factories as well as water in industrial drainage were higher than the standard.

Similarly, the density of *E. coli* of the effluent water of wastewater treatment in the factories was considerably higher than the standard values. The maximum *E coli* density in the QCV08:2008/BTNMT regulation for water quality for aquatic animal and plant resources protection (class A2) is 50MPN/100mL, that value in the effluent water of the two factories and in the drainage were much higher than the standard. In particular, the *E. coli* density in the drainage was recorded at $1.2x10^4$CFU/mL averagely, which is around 250 times higher than this standard.

The density of heterotrophic bacteria is an important parameter for the study of the biological wastewater treatment system for removal of nutrients as heterotrophic bacteria plays critical role in nitrogen and organic matter removal processes by organic compound oxidation, and denitrification, etc. Metcalf et al. (2003) and Seviour et al. (1999) stated that in anaerobic condition heterotrophic bacteria can use available nitrate and biodegradable organic compounds for getting energy for cell growth and new cell synthesis. By this process, nitrate nitrogen are oxidized to nitrogen gas, and thus nitrogen in wastewater can be taken out of the systems. Similarly, in aerobic condition, heterotrophic bacteria uses organic matter for cell growth and new cell synthesis, thus it is one of the ways for removal of organic matter in wastewater by biological method. The density of heterotrophic bacteria in the effluent is at $4.06x10^6$CFU/mL, which was less than in influent wastewater, at $8.3x10^8$CFU/mL averagely. Both of the two values showed high density of heterotrophic bacteria. Those data indicates that although the density of heterotrophic bacteria in the effluent reduced by the wastewater treatment of the factories, the heterotrophic bacteria still remained at high density, which indicates that this wastewater can be appropriate for continuously treating by applying biological treatment.

It can be concluded that concentrations of some pollution indicating parameters, including TN, TP TOC, *E. coli* and coliform density of the treated water by wastewater treatment systems of the factories were over standard for seafood products processing industry and industrial wastewater in Vietnam. Therefore, it is an urgent need for stakeholders, including factories and industrial governing board, to consider seriously about this issue as well as finding solution for wastewater problems. Amongst the potential solutions, better treating the wastewater before discharging into nearby water bodies is needed.

***Topic 2*: Impact of domestic and industrial wastewater on water quality of Mekong River at Can Tho city**

Can Tho City, facing Hau River, one of mainstreams of Mekong River, is located at the centre of Mekong Delta, and is characterized by rapid urbanization and industrialization. However, due to weakness in wastewater management and low-developed wastewater management infrastructure, domestic and industrial wastewater of the city seriously polluted the Hau river. This study was carried out to assess the impact of domestic and industrial wastewater on the water quality of Hau River at Can Tho city.

For this purpose, water samples were collected from 3 sites at the mainstreams (O Mon, Ninh Kieu, and Cai Con) and 3 sites of its branches in Can Tho city (Tham Tuong, Cai Khe, and Sang Trang) affected by urban wastewater (Figure 4). Particularly, Tham Tuong and Cai Khe were exchange water with Hau river and receiving large amount of domestic wastewater on nearby high population density area. The Sang Trang canal is receiving not only domestic wastewater but also waters from more than 10 drainages from Tra Noc industrial zone. Additionally, wastewater samples from 10 households and 4 drainages in Tra Noc industrial zone were also collected for estimation of total pollution load of the city.

Figure 4: Sampling sites in mainstream and branches of the Mekong River at Can Tho city

Surveyed results shows that water pollution indicating parameters such as chemical oxygen demand (COD), NH_4^+, and electrical conductivity (EC) in the branches of the Mekong River water were much higher than the prescribed limits by the national technical regulation for surface water quality in Vietnam (QCVN08:2008/BTNMT, class A1) and fresh-water quality guidelines for protection of aquatic life (TCVN 6774-2000/BTNMT).

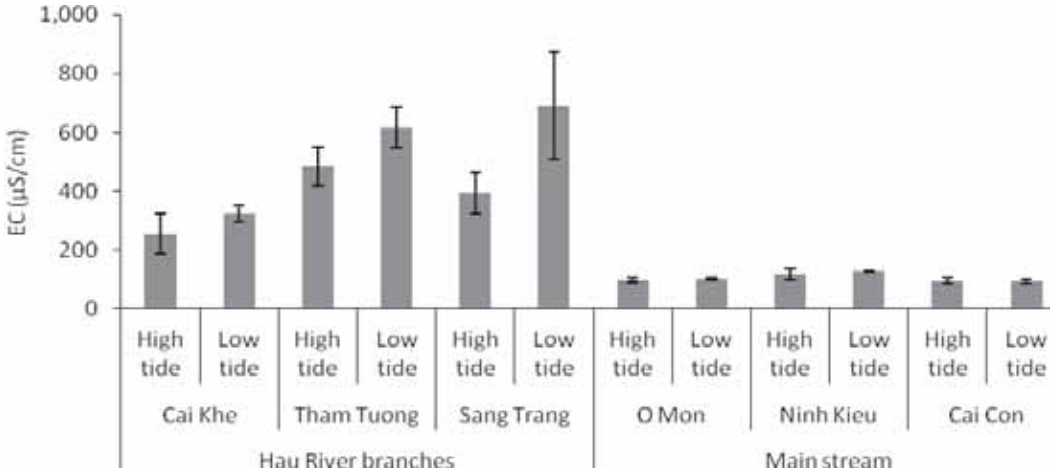

Figure 5: EC of water samples in mainstream and branches of the Mekong river at Can Tho city

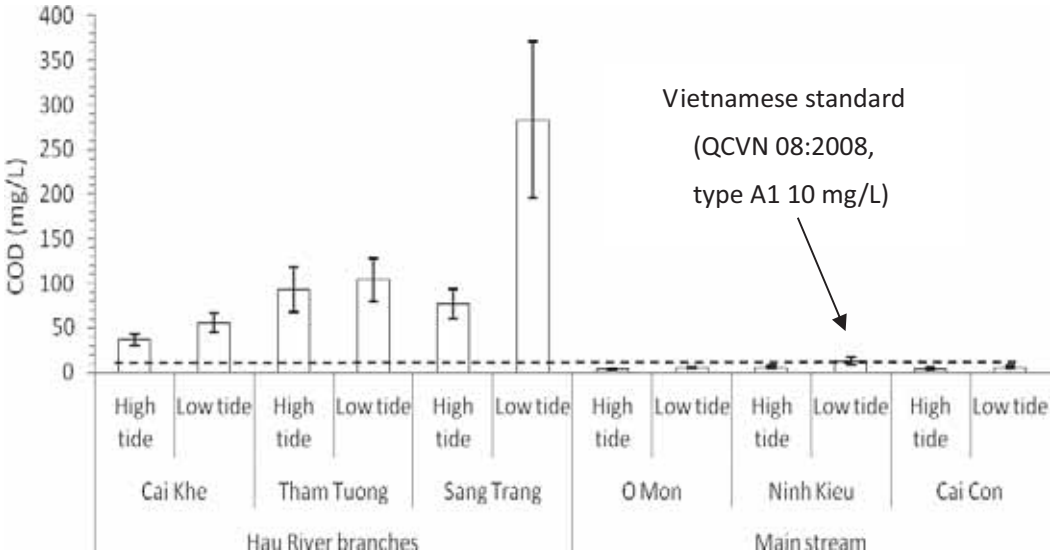

Figure 6: COD concentration of water samples in mainstream and branches of the Mekong River at Can Tho city.

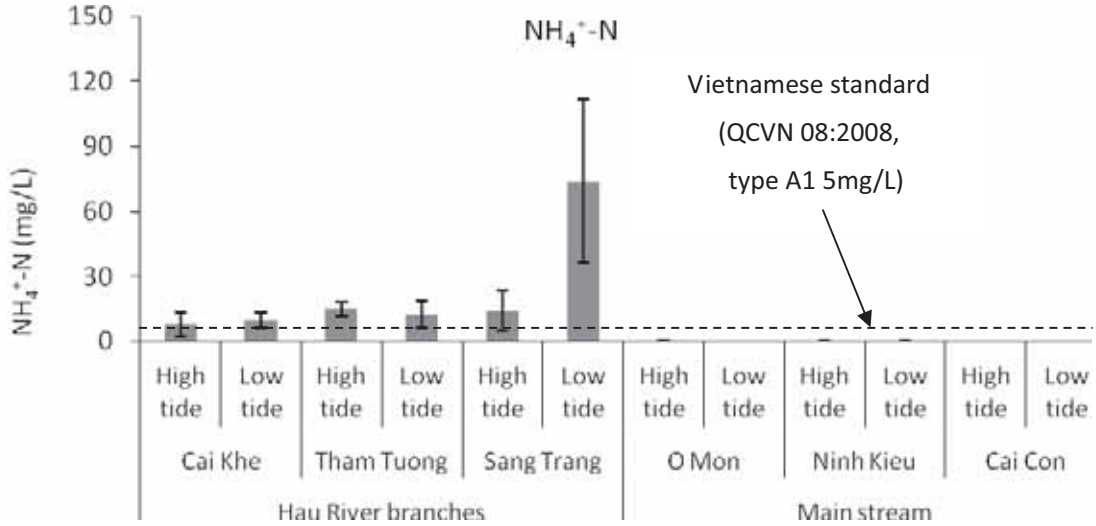

Figure 7: NH_4^+-N concentration of water samples in mainstream and branches of the Mekong river at Can Tho city

Surveyed physiochemical parameters of water quality in the mainstream of Hau River were in the range of QCVN08:2008/BTNMT standard. Average COD value in O Mon, Ninh Kieu, and Cai Con were respectively 4.4mg/L, 9.0mg/L, and 4.8mg/L. However, it was recorded that there was considerable different of COD values in low tide and high tide in Ninh Kieu site. While the COD concentration in high tide in Hau river in Ninh Kieu at high tide was 5.3mg/L averagely, that value in low tide was 12.7mg/L, which was over than the criteria (the QCVN08:2008/BTNMT defines the COD value of surface water quality in class A1, water can be used for water supply, is 10mg/L). It can be explained that although this sampling site is in mainstream of Hau River, it located in the center of Can Tho city where directly impacted by many low quality water from canals in the city, including Tham Tuong and Cai Khe, and Sang Trang canal, therefore the pollution load from those urban canals can pollute the water in the nearby mainstream sites like in Ninh Kieu.

Values of COD, NH_4^+ and EC in the branches of the Mekong River exceeded the range of surface water quality in QCVN08:2008/BTNM class A2 standard, which can be used for water quality for aquatic animal and plant resources protection. In particular, in Sang Trang canal, which receives wastewater from factories in Tra Noc industrial zone, was extremely polluted. The COD concentration from drainages in Tra Noc Industrial zone in Can Tho city in figure 7 shows that the wastewater from Tra Noc insutrial zone were not well treated before discharging into Sang Trang canal (COD concentration were 206-1701mg/L, or 1362mg/L averagely), which led high polluted level of this canal. Tham Tuong and Cai Khe canal were also extremely polluted, whose COD value were much far over the standard for surface water quality about 3-14 times.

Sewage and industrial wastewater are important source of water pollution in the Mekong Delta, especially in Can Tho city. The wastewater characteristics surveyed from 10 households in both urban and rural and 2 sewage systems in Can Tho city shows that the level of organic matter by COD parameter was different amongst surveyed houses and during time in a day. The COD value in urban sewage was in the rang of 5.3–398.5mg/L, averagely 124 mg/L, this value in rural sewage ranged from 12.8 – 244.8mg/L, averagely 109 mg/L.

Figure 8: Percentage of black wastewater (toilet uses) and gray wastewater (other uses) in domestic wastewater in rural area in Can Tho city

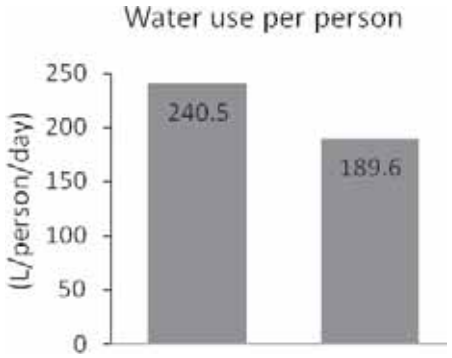

Figure 9: Volume of water used per person per day in rural area in Can Tho city

Figure 9 shows the volume of water used by person in a day. There was a small different of the average volume of water used everyday of a person in the rural and urban area. The data show that averagely a person living in the rural area uses 240.5 L, while this figure for person living in the urban area is little smaller, at 189.4L

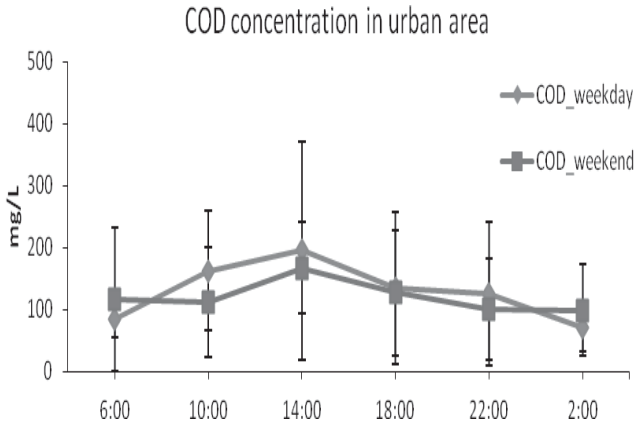

Figure 10: COD concentration of domestic wastewater in urban area in Can Tho city

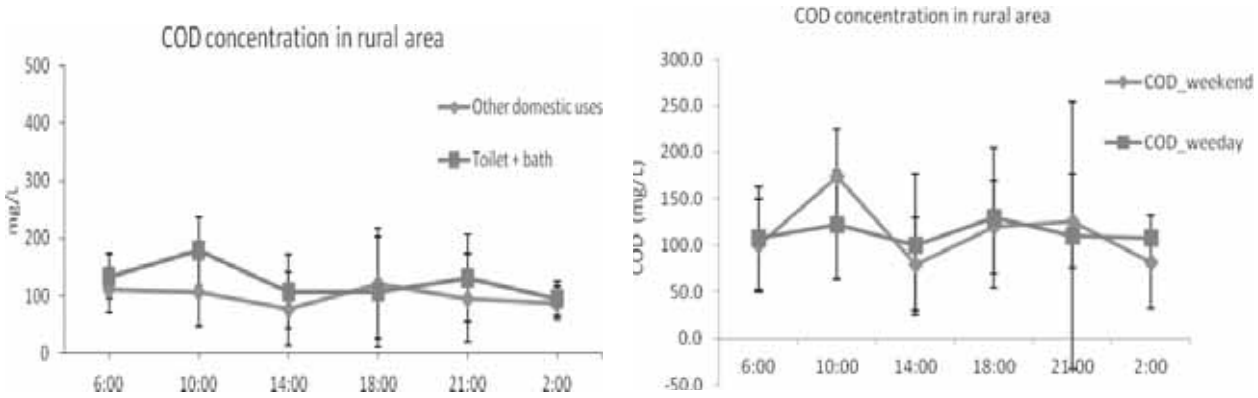

Figure 11: COD concentration of domestic wastewater in rural area in Can Tho city

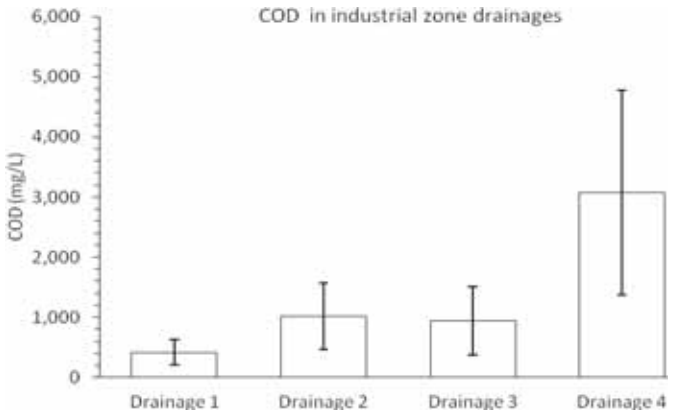

Figure 12: COD concentration from 4 drainages in Tra Noc Industrial zone in Can Tho city

Calculation of annual pollution load in Can Tho city: The pollution load are calculated by following functions:

+ COD load from urban and rural area (M): M = C x V, where, C is the average COD concentration from domestic wastewater, and V is the average volume of wastewater per capita

+ COD load from industrial wastewater: M = C x V, where C is the average concentration from industrial drainages, and V is the estimated volume of wastewater from all industrial zone in Can Tho city.

Table 1: Calculation pollution load of Can Tho city by domestic wastewater

	Rural					Urban		
Parameter	**Black WW**	**Gray WW**	**Average**	**Max**	**Min**	**Average**	**Max**	**Min**
Population	400,000	400,000	400,000	400,000	400,000	800,000	800,000	800,000
Wastewater concentration (mg/L)	125	100	109	248.5	67.5	124	195	71
Wastewater volume(L/day/person)	88	152	240	240	240	190	190	190
COD load per person (gCOD/day)	11	15	26	60	16	23.5	37.0	13.4
COD load per year (kgCOD/year)	1,607,643	2,224,748	3,832,391	8,707,440	365,200	6,868,359	10,806,897	3,925,251
Total COD load (kgCOD/year)	***10,700,749***		***19,514,337***	***6,290,451***				

Table 2: Calculation pollution load by industrial wastewater and total load by sewage and industrial wastewater of Can Tho city

Parameter	**Average**	**Max**	**Min**
COD concentration (mg/L)	1,362	1,701	206
Volume of wastewater (m^3/day)	90,000	100,000	80,000
COD load per year (kgCOD/day)	122,580	170,100	16,480
COD load (kgCOD/year)	***44,741,700***	***62,086,500***	***6,015,200***
Total COD load annually by sewage and industrial wastewater in Can Tho city	**55,442,449**	**81,600,837**	**12,305,651**

Table 1 and Table 2 show the calculation of critical pollutant load by domestic wastewater and industrial wastewater respectively. It is indicated that every year Can Tho city has discharged into the Mekong River the total COD load 1.2-8.2x10^7kgCOD.$year^{-1}$ or 5.5x10^7kgCOD.$year^{-1}$ averagely, in which 0.63-1.9x10^7kgCOD.$year^{-1}$ (or 1.1x10^7kgCOD.$year^{-1}$ averagely) from domestic wastewater, and 0.6-6.2x10^7kgCOD.$year^{-1}$ (or 4.5x10^7kgCOD.$year^{-1}$ averagely) from industrial wastewater.

***Topic 3:* Study on the integrated VACB farming system in Hoa An commune**

In the Mekong Delta of Vietnam, most of farmers have small-farm management scale, and many of households are under poverty line due to high density of population and problem soils. And Hoa An

commune is located in acid soil area, where farmers have been facing many difficulties in livelihood by the non- favorable soil for crops.

We visited farmers who were practicing VACB (farming system composed of "Vuon" for orchard or vegetable planting –"Ao" for pond –"Chuong" for pigpen and Biogas). As talked with the farmer, we have known that he was trying to promoting diversification of farm management by combining crop culture with pig raising, aquaculture, and orchard as well as intensification of cropping activity in order to increase income and environmental quality improvement. The livestock feces, which being abandoned to ponds and canals in the end, which might result in water pollution in ponds and canals and included its high risks to people health. However, by trying to apply VACB, although it seemed not so completed, which focus on collecting pig waste and human toilet-waste for the plastic biogas system, farmers have reduced the cost for other energy cost for cooking, as well as reducing consumption of fuel wood. Besides, to the farmer, the risk of water pollution will be reduced due to better management of waste and wastewater from his family.

It could be seen that although the practices in the farmer's house we visited still remained some issues such as the sludge from the biogas were not well managed, or in some other VACB cases the safety of fish in fish pond component by receiving nutrition from biogas sludge. In spite of theses issues this system can be a good approach for nutritional recycling in farming. The VACB is effective farming systems which can be suitable for small scale farmers in rural area in the Mekong Delta. This can contribute to improving farmer income, reducing labor cost, and reducing environmental pollution by decreasing fire wood consumption, reducing pollutants discharge from household and agricultural activities into natural environment.

Topic 4: O Mon landfill – a case study of solid waste management

Although I have known general situation of several landfills in Vietnam, this was the first chance to visit a landfill site with clearer observation and getting detail instruction by landfill management staff. I was so surprised to know that although the landfill was open landfill with poor management, it was located in the central area of high population area and rice fields. O Mon landfill site was almost full with dumped materials, Therefore garbage brought in is not continuously stored here anymore, but it is still used as a middle-conveying station of garbage of O Mon district before transporting to the Tan Long landfill, another landfill in Can Tho ciy. I was surprised from the poor management procedure of the landfill, which was very nearby resident and production area. The landfill was totally open, which caused very strong smell to large surrounding area. The leakage from landfill was not treated but going directly to the surrounding rice fields or partly collected by a drainage system, which lead the leakage to the local canal systems. Moreover, the floor of the landfill was not protected from groundwater by any protection sheets. Therefore, ground water pollution in this area was one of the great concerns of people. It has been known that more than 35,000 people lives within 10 km from the landfill, where large percentage of people uses surface water and ground water for domestic use, including drinking water.

As mentioned by the landfill management staff, who come from the Dept. of Natural Resources and Environment of O Mon district, it was not easy to say what local people can do for protection themselves from effect by the landfill, but it is an urgent need for a better management of solid waste, not only in this

area but whole Vietnam country. And amongst many experiences from other countries until now. The 3R strategy, i.e. reduce – reuse – and recycling are the top effective strategy.

***Topic 5:** Visit Bach Ma National Park and charcoal project by TUAT in the buffer zone*

The Bach Ma national park is located in Thua Thien Hue Provinve, in the central of Vietnam. This is an mountainous area where the natural condition is not favourable for agriculture, especially with poor fertility of soil. This condition lead to stress on natural resource as people are poor and come to the forest for exploitation of forest for animal, plants, wood, etc. Tokyo University of Agriculture and Technology and local government therefore have set up an project called "Bach Ma charcoal project" for improving livelihood of local people in buffer zone, mainly in Khe Su hamlet.

Many activities has been carried out by the project such as:

- Making rice husk charcoal for making organic fertilizer for firtile the agriculture land
- Training farmer how to plant vegetable by using organic fertilizer
- Training farmer on livestock raising technique using wood vinergar
- Enlarging the market system for local organic product by making connection with organic product company and being together with ecotourist in Bach Ma national park

It can be seen that all the activities of project are very important and it is key fators for changing the attitude of local people more environmental friendly and a solution to reducing pressure on natural resources conservation. By talking with local people and project staff, we can also find that by participation in the project activities, local people increases their awareness on protecting natural reserve and the livelihood of local people are more diversify. We also learn that the partipation of local people on project activities might be an important to increase their people consodility as they have more chance together and sharing oppinions and help each other.

All in all, a two week oversea field training with my supervisor and FOLENS team was great oppotunity for me to explore and understand more about environmental issues in Vietnam as I could learn not only knowledge and skill related to my research topic on wastewater treatment but also experience how the impact of human on natural resources and environment, which should be in serious consideration by all of us for a sustainable world development.

(3) Achievements and its future vision

My long-term goal is to be a good lecturer in the field of environmental science and management in Can Tho University of Vietnam, which at that position I can exchange my knowledge and skills to students for helping the community in the Mekong Delta region. With the knowledge gained from completing FOLENS overseas training with particular focus on domestic and industrial wastewater situation and management, I could have understood more about water environmental issues and other aspects including impacts of people on natural resources and environment in different places in Vietnam. This overseas field training also offer me opportunity to learn about environmental issues from other regions by sharing viewpoint from participating students and professors, which will be very useful for my future career related

to water and waste water management as well as conducting research and starting environmental clean-up projects. All in all, I hope I would be able to share my knowledge gained throughout my master studies and FOLENS program with many students at Can Tho University and other students in Vietnam including visiting regional and international scholars.

(4) Acknowledgement

I am grateful to my supervisor, Assoc. Prof. Tarao Mitsunori, and Assist. Prof. Ozaki Hirokazu for their valuable advices, discussions as well as assists for my works during overseas field training and data analysis. Special thanks to my colleagues in Can Tho university, Mr. Le Anh Kha, Ms. Pham Viet Nu, and Ms. Nguyen Thi Linh for their arranging the samplings and sample analysis. The assistance by several undergraduates from CENRes is grateful acknowledged. Many thanks to my classmates in the oversea field training and Assoc. Prof. Kenichi Yoneda for valuable discussions during the field trip. I am grateful for supports from study sites in Can Tho and Thua Thien Hue province, including Can Tho university, Quang Minh Seafood factory and Mekong Factory in Tra Noc Industrial zone, O Mon landfill, Can Tho Water Supply Company, and Bach Ma National Park. This oversea field training is assisted and financially supported by the Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa (FOLENS), of Tokyo University of Agriculture and Technology, Japan.

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Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Suspended Sediment Transport in Mekong River

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Destination and period: Can Tho University in Vietnam, 09/03—09/16/2012

Key words: suspended sediment transport, Mekong River, Vietnam

Abstract

To understand the sediment transport in Mekong River in South Vietnam, I went Vietnam field training under FOLENS program. Our field training was conducted from September 3 to September 16, 2012. Though the study was constrained by the limitation of data, the results provided a quantitative portrait of the sediments patterns in the basin and the places where soil erosion is found to be maximal. Obtained data of Mekong River will be used to know whether erosion or deposition will occur, the magnitude of this erosion or deposition, and the time and distance over which it will occur. Sediment transport is applied to solve many environmental, geotechnical, and geological problems. Movement of sediment is important in providing habitat for fish and other organisms in rivers. Therefore, managers of highly regulated rivers, which are often sediment-starved due to dams, are often advised to stage short floods to refresh the bed material and rebuild bars. This is also important, for example, in Mekong River, to rebuild shoreline habitats also used as campsites. Also sediment discharge into a reservoir formed by a dam forms a reservoir delta. This delta will fill the basin, and eventually, either the reservoir will need to be dredged or the dam will need to be removed. Knowledge of sediment transport can be used to properly plan to extend the life of a dam.

(1) Contents and activities during the overseas field training (less than 600 words)

To gain practical experience at real site of environmental issues, I selected the field training in the FOLENS program. This field trip was conducted Can Tho University in Vietnam, under the professor Hirokazu OZAKI sensei, Tarao sensei, Hayashidani sensei, and Yoneda sensei from September 03 to 18, 2012. Topic was chosen as title :“**Suspended Sediment Transport in Mekong River**”.

As well know, The Mekong (Figure 1.) is a river in Southeast Asia. It is the world's 12th-longest river and the 7th-longest in Asia. Its estimated length is 4,350 km, and it drains an area of 795,000 km2, discharging 475 km3 of water annually. From the Tibetan Plateau this river runs through China's Yunnan province, Burma, Laos, Thailand, Cambodia and Vietnam. Because of owing to human destruction, Mekong river natural environment is becoming more intolerable. Many environmental problems are affecting to our daily life. These problems cannot be manages an individually to any nations. Therefore, we should analyze these problems from an international perspectives and multidiscipline view to find proper ways to solve them effectively. In my mind, correct ideas come from on-the-spot or filed-based investigations, precise data and monitoring comprehensive analyses are essential. In 1995, Laos, Thailand, Cambodia and Vietnam established the Mekong River Commission to assist in the management and coordinated use of the Mekong's resources. In 1996 China and Burma became "dialogue partners" of the MRC and the six countries now work together within a cooperative framework.

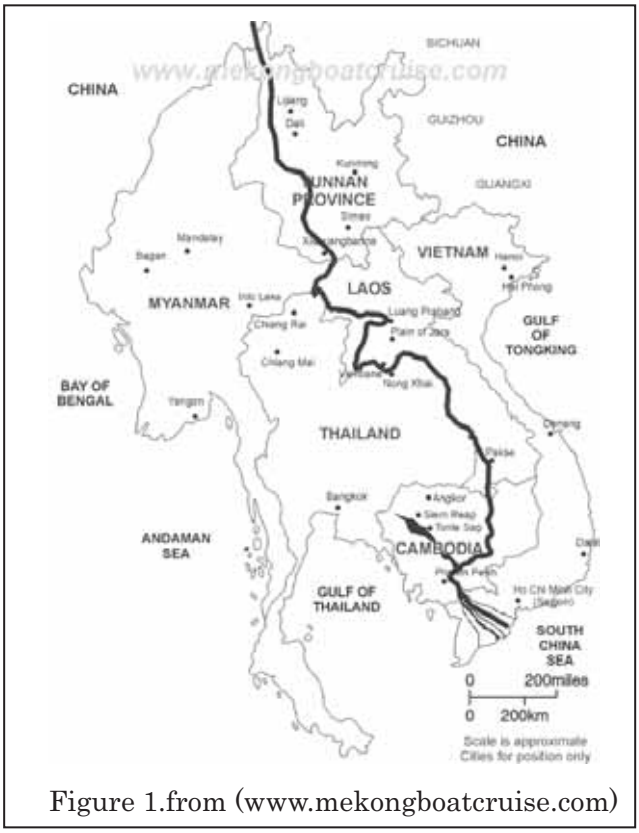

Figure 1.from (www.mekongboatcruise.com)

Flow in culverts, over dams, and around bridge piers can cause erosion of the bed. This erosion can damage the environment and expose or unsettle the foundations of the structure. Therefore, good knowledge of the mechanics of sediment transport in a built environment are important for civil and hydraulic engineers. When suspended sediment transport is increased due to human activities, causing environmental problems including the filling of channels, it is called siltation after the grain-size fraction dominating the process. So there are various environmental problems related to suspended sediment transport. For instance, in the Inner Mongolia, the yellow river had brought us serious floods because of suspended sediment transport (soil) and vegetation system. Many villages were destroyed by floods completely and hundreds of millions of people lose their parents, children, houses and so on. Many Areas had affected by water pollution. There how we control or utilize water and soil resources are very significant to improve controlling soil erosion and water losses as well as the other natural resource. Meanwhile, we also can utilize the resource sufficiently through solve the environmental problems.

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

2.1 Summarized resulted of previous studies in Vietnam

Sediments transport and erosion is a complex natural process that is strong increased by human activities such as deforestation, agriculture. In particular, Suspended sediments play a key role in controlling water quality and it can cause a major reduction on stream capacity for handling flood waves.

The erosion in the Mekong Basin is mainly rainfall based runoff erosion subject to the effects of land cover. Soil erosion patterns in the basin are heterogeneous; therefore, patterns of soil erosion are difficult to model and predict particularly when data availability becomes a second constraint. The fact that, the river basin lying across six countries has caused the system analyses significantly a complex task.

2.2 Significant experiences and lessons

Beside significant science findings, the overseas field training has brought a lot of available experience and lesson through meeting, group working and outside activities. One of the most significant experiences is analyzed and discussed suspended Sediment Transport data of Mekong Delta such as season and water pollution, plant etc. Moreover, through group discussion with difference of academic disciplines, nurture insights and skill, understanding of various aspects of environment would be good chance to study more professional knowledge and accumulate more practical experience about environment. Most important of all, I will devote myself with strong responsibility and strict plan to the duty. Therefore, I think, it is very helpful to our future study and career development.

The significant lesson that I gained from conducting this field trip is detail in preparing instruments and necessary condition in coming local. The participation of managers, lectures and student; instruments working statement in different condition, and insurance condition of station have decided the successful of the field trip. Through this field trip, I know that various aspects of local environment will be understand easily by people , however, it is so difficult to be answered that how to get method and what can help to get this information. This field trip has help lecturers of Can Tho University to answer the difficult question.

(3) Achievements and its future vision (less than 400 words)

According to this field experience in Vietnam, I had scientific and practical knowledge and Viewpoints for approaching and developing watershed systems including mitigation of environmental disasters, such as suspended sediment transport, flood and water pollution etc. For applying the local and regional environmental issues in Asian and Africa, strong interdisciplinary approaches are important. Moreover, I think the same environmental problems can be occurred under similar environmental and socioeconomic conditions when we compare the geomorphology and geography across Asia and Africa. Therefore, my experiences in EPA including learning the field experience in Vietnam will be strongly connected my future careers for tacking the environmental concern including the part of forest management and suspended sediment transport in intermongolia as well as Asian and African region. In addition, I will get more knowledge skill and experience for achieve a leader in environmental sectors.

Everyone was known about FOLENS program and how to utilizing network and friendship with other international students in this program and IEAS. This network will also be important for future generations, and contribute to the world is enterprise of preserving our planet, in which, Inner Mongolia is an indispensable part.

(4) Acknowledgement

In my mind, correct ideas come from on-the-spot or filed-based investigations, precise data and monitoring comprehensive analyses are essential. The education program for Field-Oriented Leaders in Environmental Sector in Asia and Africa (FOLENS Program) for master's students at Tokyo University of Agriculture and Technology (TUAT) can provide us approaches precious opportunities to improve our professional skills and personal ability as an environmental leader. It is very helpful to our future study and career development. I would like to express our sincere gratitude professor Hirokazu OZAKI sensei, Tarao sensei, Hayashidani sensei, and Yoneda sensei for providing continuous encouragement and enthusiastic support during the time of fieldwork while we were in Vietnam. I appreciate the help by field and laboratory assistances in Vietnam Can Tho University, especially Can Tho University student for your support of the fieldwork.

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(Supervised by WANG JIGEMUDE)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Dairy Industry impacts on economy and environment in Vietnam

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Vietnam
03. Sep,2012 -10.Oct.2012

Key words: Dairy Industry, Environment, Manure, VAC system, Biogas,

Abstract

I observed a lot of dairy farmers in Vietnam from September 3rd to October 10th. And I had checked the present situation between dairy industry and environment issue.

After the Vietnam government had announced the “Doi Moi” policy in 1986, the economy of Vietnam has been increased. Livestock products consumption had been increased. In 2001, the government had announced “Dairy Industry Promotion Plan” And dairy cattle number which was 100,000 heads in 2005 were reached as the plan target. Furthermore, “Livestock Development Strategy 2020” was announced by the Vietnam government in 2007. Vietnam wants to produce a lot of livestock products and improve the self-sufficient ratio, which should be increase. And Vietnam wants to export livestock products to abroad.

The more the cattle numbers will increase, the more manure treatment problem will happen. Farmers should solve the environment pollution problem by manure. So durin g my visit in Vietnam, I observed livestock production situation from south to north in Vietnam. And I observed land use condition for livestock industry and agriculture. They make use of manure through VAC system and biogas system and charcoal and compost production in Bac Ma project. And they use by-products as fish feed, energy and fertilizer through farming system in Vietnam.

I collected the data from dairy farmers in Ba Vi district and Moc Chau district in north Vietnam.Because they have limited land and are so busy, they could not make use of manure as fertilizer. A quarter to a third farmers (25% (Ba Vi), 34% (Moc Chau)) threw away manure to a stream and river near their house.

Because I have had experience of this Overseas Field Training and career of FOLENS leader on

environment, I would like to continue to give advises to Vietnam. I think what I am able to make use of the experience in the future.

(1) Contents and activities during the overseas field training

Title: Dairy Industry impacts on the economy and environment in Vietnam
Names of the counterparts and professor :

Dr. Khai (Can Tho University, Professor) ,
Dr. Phung (Hue University, Professor),
Dr.Dat (National Institute of Livestock Science (**NIAS**), South Section)
Dr.Phuong (Ministry of Agriculture and Rural development (MARD), Ho Chi Minh Office)
Dr. (Ministry of Agriculture and Rural development (MARD) Livestock Industry Bureau, Ha Noi Main Office)
Dr.Cuon (NIAS, Vice-director)
Mr.Dzung (NIAS, International Cooperation Division Chief.)
Dr.Luon (NIAS, Ba Vi Cattle and Forage research Center, Director)
Mr. Nam (Moc Chau Dairy Industry Cooperative Technical Division. Chief.)
Younger counterpart (Mr. Linh (NIAS), Ms. Loan , Ms.Ha and Mr. Thinh (Ba Vi center)), etc.
Dr.Suu, Mr.Son and member staffs (NIAS)
Ms.Mai Ha (Water buffalo reseach Center)
Mr. Bien (Top Feed Company, Grass researcher)
JICA Food safety Project Team leader, Coordinator and secretary(translator)
Mr. Shimizu (JICA Ha Noi Office, Vice Director)

Training schedule : (detail schedule is attached)

03.Sep. – 09.Sep. South Vietnam (Can Tho , Ho Chi Minh city) [University, the Ministry of Agriculture and Rural development (MARD)]

09.Sep. – 15.Sep. Central Vietnam (Da Lat , Da Nang , Hue) [University, Dairy company in Da Lat, Bach Ma Project]

16.Sep. – 10.Oct. North Vietnam (Ha Noi , Ba Vi , Moc Chau) [NIAS,MARD,JICA project site]

Activities : I visited famous livestock production area with Vietnamese researcher. I observed a lot of dairy farmers and how to treat a lot of manure in the area.
[Visiting area]

1. University : Can Tho, Hue, Ha Noi
2. Ministry of Agriculture and Rural Development (MARD) : Ho Chi Minh, Ha Noi.
3. National Institute of Livestock Science (NIAS) : Ha Noi (Head Quarter, Water Buffalo Research center), Ba Vi (Dairy cattle and Forage Research center).
4. Big farm lunch and medium - small scale dairy and pig farmers : O'Mon farm (Can Tho), Dairy farm

(Cu Chi, Ho Chi Minh), Bach Ma Project Farmer (Bach Ma), Dairy farm (Da Lat),IDP farm (Ba Vi), Dairy farm(Ba Vi), Moc Chau Dairy Cooperative Union farm(Moc Chau), Dairy farm (Moc Chau)

5. Milk factory and Milk products shops : Da Lat Milk Factory (Da Lat),Moc Chau Dairy Factory (Moc Chau), Milk and milk products shops (Ba Vi and Ha Noi),
6. Feed factory : Moc Chau Feed Factory (Moc Chau), Top Feed Co. (Bach Ninh)
7. JICA(Japan International Cooperation Agency) : Ha Noi Office and JICA Project (Food safety Project and Farmers Union Project)

[Activities]

＊I visited dairy farmers and observed and checked manure treatment system.

＊In Ba Vi and Moc Chau, I surveyed dairy farm and collect questionnaire answer sheets from them.

＊I exchanged opinions with researchers of NIAS. Now they have an International cooperation of Denmark. When I visited NIAS, a Danish expert did lecture for the younger researchers in NIAS.

＊I collected answer sheets of my questionnaire (14 Pages), 50 farmers in Ba Vi district and 65 farmers in Moc Chau district.

[Observation of manure treatment]

VAC system is very popular in the south area. Biogas system is also popular in the south and central area. Compost making is very popular from south to north area.

In Can Tho province, the farmers of O' Mon district made use of the pond for VAC system and combind biogas plant. And they planted elephant-grass to dairy cattle. They will scatter the bottom soil in the pond to grassland as fertilizer (soil amendment) twice in a year.

In Ho Chi Minh, the farmers in Cu Chi also planted elephant-grass for dairy cattle. They scattered manure in the grassland.

In Hue, the farmers of Bach Ma project produced charcoal from rice straw and husk and used them as a medicine for pigs and mixed charcoal with manure as fertilizer. Bad smell of manure decreased through the production of compost. They are able to sell the compost as soil amendment.

In Ba Vi and Moc Chau district, many farmers planted a lot of type grass and corn, they used manure as fertilizer. Some farmers tried to use biogas system in Ba Vi and Moc Chau. It is very commonly used for methane gas like the southern Vietnam.

However some area I observed a lot of manure flew into a stream and pond directly. I worry about disease for people, especially for little children will happen.

FOLENS member and I have heard bacteria contamination in the well water from the professor of Hue University. He explained us 10-20% of well water was contaminated by microorganism such as E.coli and Salmonella. I thought that the walls of Biogas plant were constructed by brocks and cement and were broken because some of them built very long ago. And sometimes the bottom of the Biogas plant was just hard soil and stone. So a lot of manure was leaked from the Biogas plant.

(2) Findings and achievements obtained, significant experiences and lessons

【Findings】

I had observed Biogas system and VAC System in Middle and North Vietnam already. But it was first time to observe the VACB system in Can Tho area. VAC system is very popular in Mekong river area. But I heard some bacteria disease occurred near the farming system from Professors of Can Tho University and Hue University.

I have got a lot of statistic on livestock sector. The officer of livestock production sector explained to me livestock number was increasing under "Dairy Industry Promotion Plan" and "Livestock Development Strategy 2020 (Phat Trien Chan Nuoi den nam 2020)" And they did not worry about manure treatment problem though environment issue was written in the document of "Livestock development Strategy 2020". But I actually observed that Ba Vi and Moc Chau area farmers flew manure to a stream and river.

My study member Ms. Kinh had checked microorganism contamination of water in Mekong river basin area. On this training, I collected data from farmers and recommend environment problems possibility to staff of MARD and NIAS. I thought it was stronger impact to them if I attached bacterial data of North Vietnam.

【additional data and opinion】

Now milk consumption is increasing in Vietnam. People say that milk is good for health, beauty and the brain for children. A researcher in Vietnam told me that Vietnamese will become taller after milk consumption will be increased. So I decided that my research theme is "Dairy industry development history in Vietnam" at present.

Government made the policy program from the point of modernization and farmer's income increasing in Vietnam. However dairy cattle management technology should not reach at the progress speed of milk production. The number of extension officers is not enough.

Only the cattle number had reached at the target number in 2005 because dairy cattle had imported from New Zealand and Australia, and so on. Technology and social infrastructure like milk factory and refrigerator also should make modernized in dairy industry in Vietnam.

Manure treatment technology is one of the livestock sector technologies, but farmers thought that was not produce money. The most of farmers did not invest for manure treatment plant.

Now I would like to explain the present situation and solve some problems on dairy industry though Vietnam Livestock Industry Scientific Academy..

【Present situation】

Since "Doi Moi" policy had been announced in 1986, Vietnamese economy has been developed very quickly. Annual GDP per capita reached at 400 US Dollars in 2000.Recently livestock number has been increased, especially the number of dairy cattle, beef cattle, pig and poultry. is increasing rapidly.

Annual GDP per capita came over 1,100 US Dollars in 2011. So the consumption of livestock products increased in these 10 years. Especially the consumption of milk and milk products including infant

milk increased.

In 1990 the consumption of milk was only 0.5kg/capita/year. It was the least consumption volume in 10 countries in South-East Asia. Now the consumption volume is about 7.4 kg/capita/year in 2010. That means Vietnam is the fifth country in the ASEAN 10 countries on the consumption of milk.

The number of dairy cattle increased from 34,982 heads in 2000 to 142,702 heads in 2011. Milk production increaced from 51,458 tons in 2000 to 345,444 tons in 2011.

The volume of grass that dairy cattle eat everyday is 3% volume of body weight. And cow produce milk and about 15~30 kg feces everyday. Therefore large amount of manure is excreted and that take place many environment problems like bad odor, ammonium (NH_3), greenhouse gas, and pathogen problem.

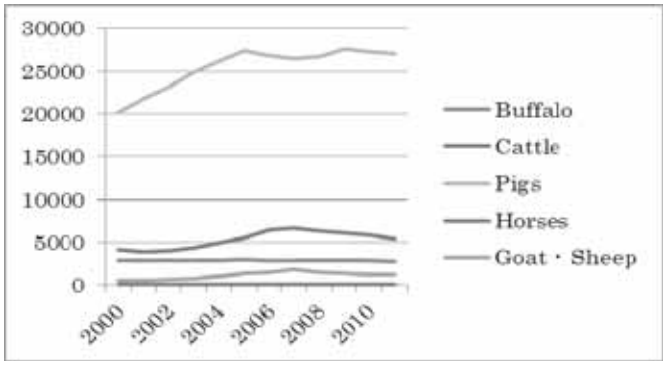
In case of farmer continue to keep small and medium scale, environment problems do not happen so frequently. Even farmer keep manure in a small hole, the environment problem do not happen.

VOC and Biogas system is very nice manure treatment method and environment –friendly method. Farmers are able to do aquaculture and make use of the methane gas (CH_4) energy for light and fuel in their home. They save money and solve the green gas problem. And some disease outbreak ratio becomes lower. They have to solve the above mentioned problems.

Table 1 : Livestock number from 2000 to 2011
(unit: thousand heads, million heads(Poultry))

	Buffalo	Cattle	Pigs	Horses	Goat ・ Sheep	Poultry
2000	2897.2	4127.9	20193.8	126.5	543.9	196.1
2001	2807.9	3899.7	21800.1	113.4	571.9	218.1
2002	2814.5	4062.9	23169.5	110.9	621.9	233.3
2003	2834.9	4394.4	24884.6	112.5	780.4	254.6
2004	2869.8	4907.7	26143.7	110.8	1022.8	218.2
2005	2922.2	5540.7	27435.0	110.5	1314.1	219.9
2006	2897.2	6510.8	26855.3	87.3	1525.3	214.6
2007	2807.9	6724.7	26560.7	103.5	1777.7	226.0
2008	2814.5	6337.7	26701.6	121.2	1483.5	247.3
2009	2834.0	6103.3	27627.7	102.2	1375.1	280.2
2010	2876.9	5916.2	27373.1	93.1	1288.3	300.5
2011	2802.0	5708.9	26300.5	88.0	1197.2	293.7

Resorse: Statistics Year Book, 2005,2011 Statistics of Department of Animal Husbandry (DAH-Ministry of Agriculture and Rual development Statistic bookVol1,P341)Chan Nuoi Viet Nam 2000～2010、Ministry of Agriculture and Rual Development 2010.12



Graph 1: Livestock number from 2000 to 2011

Table 2 : Dairy cattle number in each district of Vietnam (2001～2011)

(Unit; thousand heads,%)

	Northern mountain	Hon river delta	Middle	Tay Nguyen	South east	Mekon delta	Whole country
2001	3,120	3,036	1,460	804	33,120	1,837	41,241
2002	3,859	4,030	1,175	1,007	42,938	3,840	55,848
2003	6,954	9,033	5,430	1,732	51,080	4,996	79,225
2004	9,880	11,424	8,749	2,119	56,799	6,823	95,794
2005	10,516	11,975	6,831	2,549	63,939	8,310	104,120
2006	9,415	10,659	4,737	2,901	75,066	10,437	113,125
2007	7,001	9,136	2,857	2,721	67,690	9,254	98,659
2008	8,390	9,328	1,756	2,786	76,587	9,136	107,983
2009	7,217	8,337	1,957	2,839	79,569	15,599	115,518
2010	8,730	10,840	9,870	4,670	81,510	12,950	128,583
Ratio(2010)	6.78%	8.43%	7.67%	3.63%	63.39%	10.07%	100.0%

Resourse: Chan Nuoi Viet Nam 2000～2010、Ministry of Agriculture and Rual Development 2010.12

(3) Achievements and its future vision

Now we face many global issues, food production, food safety, environment, greenhouse gas, poverty, mal-nutrition, labor, population increase, education and civil war, and so on. I am interested in solution of those problems through international cooperation for developing countries. As I am veterinarian and livestock engineer, I would like to try to solve the environmental problem in the developing country as professional expert for higher level engineer.

I have had a lot of experience to do international cooperation for livestock production as JICA expert and upper technical officer of the ministry of Agriculture, Forestry and Fisheries (MAFF) in Japan. I would like to combine environment-friendly production systems in the international cooperation.

So I had learned many things including microorganism and heavy metal chemical analysis in the FOLENS program in 2012. And I took part in FOLENS overseas activity from 3rd of September to 10th

October. I also selected the class of English course and international cooperation class from September to January.

And through FOLENS overseas activity, I visited Vietnam and observed some dairy and pig farms in Can Tho province with Professor Khai and her research institute researcher. I also visited Bach Ma project near Hue city with FOLENS member-stuffs and the coordinator of the TUAT project.

Furthermore I visited many dairy farms in Da Lat, Ba Vi and Moc Chau with NIAS(National Institute of Animal Science) researcher.

I will make use of a lot of environment issues and technical matter when I become an expert for some counterparts in developing countries. So I will apply JICA expert for international cooperation again after I graduate from Doctorate course of TUAT. In the future I would like to work in Research Institute and/or University in developing countries as expert again.

(4) Acknowledgement

There are many younger generation in Vietnam. The average age is around 28year-old, in fact we are able to realize Vietnam is very young and active country compared with Japan at present situation. And the Vietnamese people study and work so hard. It looks like same situation from 1950's to 1980's period in Japan.

Since "Doi Moi" policy announced in 1986, Vietnamese economy has been developed very quickly. And livestock number is also increasing. Since 2002, dairy cattle number is increasing rapidly. A dairy cattle excrete is about 15 kg to 30 kg in a day (the figure difference is up to body weight and age (adult cattle and heifer cattle)).

If we will make use of manure as soil amendment, it is a very important natural resources. There is big difference between manure as natural resources and livestock industry waste.

So I checked and studied VAC system , Bio Gas plant and compost making system in Vietnam.

[How to solve manure problem]　Manure treatment

(1)VAC system

VAC system is Vietnamese traditional method which is combined agriculture, aquaculture and livestock industry.

V is initials of Vườn. That means garden for agriculture, fruits and vegetable.

A is initials of Ao. That means ponds (water resources) for aquaculture.

C is initials of Chuồng. That means livestock barn.

Farmers keep livestock, pigs chicken, sometimes cattle. They flow feces into ponds near livestock barn. In the ponds they keep fish and shrimp as aquaculture industry. Once or twice in a year, they pick up all of fish and shrimp to sell them in the market. They dig up the soil from the bottom of the pond and use them as fertilizer to their garden. They plant some fruit trees and vegetable in the garden.

VAC system is circulation of livestock by-product (manure). It is not only manure treatment but also environment-friendly agriculture.

(2)Bio Gas Plant:

Biogas is a mixture of Methane(CH_4),carbon dioxide(CO_2),and depending on the feedstock used, traces gases such as nitrogen(N_2), ammonia(NH_3), sulfur dioxide(SO_2), hydrogen sulfide(H_2S), and hydrogen(H_2).

Biogas is produced when certain bacteria decompose biological matter in an anaerobic (no oxygen is present) environment. This process is referred to as anaerobic digestion (AD).

Farmers use Biogas which is convenient for cooking and saving gas from industrial products. But this technique may be quite expensive for farmers to apply. Otherwise, Biogas technique only makes the best of sewage one part of feces. Other any amount of feces untreated.

(2)Composting:

Manure is loaded and fermented by anaerobic situation. After one week, it is mixed and should be checked for temperature. Temperature is going up from 60 to 70 degree centigrade. Over 60 degree of manure is able to kill wild seeds and parasites in feces. After 45-60 days, the ratio of manure moisture is not so high; about 30-40%. So the manure could be used as fertilizer. At that time, it is very easy to scatter them in the agriculture field.

The quality of manure compost should be checked. Depending on the season, there is much difference the quality of manure. In the rainy season and cold winter, fermentation speed of manure is quite low. We have to cover manure by the roof.

Data (Northern Vienam (Ba Vi and Moc Chau)

【Manure treatment】

The more the cattle numbers increase, the more manure treatment problem happens. The farmers should solve the environment pollution problem. I observed land use condition for livestock industry and agriculture.

In south Vietnam(Can Tho province) ,farmers make use of manure through VAC system.

In middle Vietnam(Hue city) , farmers use biogas system , charcoal and compost production. And they use the products, including by-products as fish feed, energy and fertilizer.

In north Vietnam(Ha Noi Ba Vi area, Son La province Moc Chau area) I collect the answer of my questionnaire for manure treatment.

(1)Ba Vi area (Ha Noi city)

Usually farmers compound manure at the back of cattle shed, and use as fertilizer twice a year in spring and autumn. They move manure by rake and shovel. Most of them do not separate between liquid and manure. And 31 farmers don’t do anything to make compost. I worry about the quality of compost. It is need to have some seminars in Ba Vi area. But 16 farmers use Biogas plant, the number is increasing compare with 2006.

In Ba Vi area, around 50% of farmer use the wheel car, and only 3 farmers use cattle or buffalo. All of

them could not use the machine.

In order to scatter compost and manure, 28 farmers do by their hand, they don't use the machine. 10 farmers (20%) had not any treatment , just only throw into stream. In Ba Vi area,they can not sell and exchange compost like Japan.

Table 3 Manure treatment in Ba Vi area (Ha Noi province).

Move from cattle shed	By hand	Wheel career	Tow by cattle	Use by machine
	14	31	3	0
How to stock	Feces	stock under roof	Lagoon	Biogas
	1	4	0	16
How to produce	Upside down	Stir	Ferment	Nothing to do
	0	0	2	31
How to scatter	By hand	Wheel career	Tow by cattle	Discharge
	28	1	1	10

Data : Reporter collected Questionnaire answer(2012)

(2)Moc Chau (Son La Province)

They move manure by rake and shovel. Most of them separate between liquid and manure.

40% (24 farmers) use the wheel career and 62%(37 farmers)use cattle or buffalo to tow manure. And only

5 farmers use by machine. In order to store manure, there are 4 stock area with roof and 1 lagoon.And 15%(9 farmers)use Biogas plant, the number of Moc Chau area is less than that of Ba Vi. In order to produce compost, 8 farmers do upside down,and 29 farmers stir compost.

In order to scatter compost and manure, 42%(25 farmers) do by their hands and same number of farmers use wheel career. 56%(34 farmers) use cattle or buffalo to tow. There are 21 farmers(35%) that discharge faces into streem. It is environmental problem.

In Moc Chau, they can not sell and exchange compost like Japan.

Table 4 Manure treatment in Moc Chau (Son La province)

Move from cattle shed	By hand	Wheel career	Tow by cattle	Use by machine
	21	24	37	5
How to stock	Feces	stock under roof	Lagoon	Biogas
	42	4	1	9
How to produce	Upside down	Stir	Ferment	Nothing to do
	8	29	2	1
How to scatter	By hand	Wheel career	Tow by cattle	Discharge
	25	25	34	21

Data : Reporter collected Questionnaire answer(2012)

[Advice for Bach Ma project]

Bach Ma project member-stuffs consider that they will continue their activities, so, I would like to convey my opinion to do the Project as follows; They should do

1. Collection of Basic data
2. Preparation of Scientific data on charcole project
3. Extension of Technology through training course
4. Continuation of discussion with some restaurants in Da Lat and Hue city for selling vegetable.
5. Prepare of Bach Ma district Development Plan
   (1) Some culture product production training
   (2) Training of English conversation
   (3) Inform Bach Ma area to some tourist companies as sightseeing area
   (4) Small agriculture and culture products market
   (7) Guesthouse building with Sanitary Toilet
   (8) Planting many flowers in the flower garden
   (9) Road construction (10) Mini Zoo

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Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Study on surface water quality in the Mekong Delta in Vietnam

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Destination and period: Mekong Delta and Hue city, Vietnam, from 03/09/2012 to 16/09/2012

Key words: water quality, environmental issues, Mekong River Delta, Bach Ma national Park, Vietnam

Abstract

The overseas field training in Vietnam from 03/09/2012 to 16/09/2012 has provided me mamy knowledge about environmental issues in the Mekong Delta and Hue city in Vietnam. During the training has studied the character of surface water in the Mekong River wastewater, I found that the water quality in mainstream of the Mekong River in Vietnam (Hau and Tien River) indicated by some chemical parameters such as COD, EC, and ions concentration was within the standard for surface water in Vietnam, while those characters of water in sub-stream of the river were at higher concentration, especially sub-streams in the city area and in drainages from aquaculture farming area. Besides, a visit to Water Supply Company in Can Tho city has provided us understanding of the surface water environment was in high pressure of pollution by impact of urbanization and understanding of technology of treating domestic water from surface river water. Additionally, we also learned about the integrated farming system which including generating biogas for family consuming from husbandry waste, and visit O Mon landfill to learn about the impact of solid waste management. Finally, visiting Bach Ma National Park was great chance to learn about how the charcoal project staff have set up activities for improving livelihood of local people in buffer zone by charcoal-applied environmental friendly farming models

(1) Contents and activities during the overseas field training

My overseas field training was carried out in 2 weeks in September 2012 under supervision of Assis. Prof. Ozaki Hirokazu, and Assoc. Prof. Kimura Sonoko Dorothea, Profs. Tarao, Prof. Kenichi Yoneda, Prof. Hayashidani and faculty in Can Tho University. Besides my main study of surface water quality in the Mekong River Delta of Vietnam, several other study sites were visited in the Mekong Delta and Thua Thien

Hue city. Particularly, in the Mekong delta, I have carried out water sampling from upstream to downstream on Hau River and Tien River such as An Giang, Can Tho, Hau Giang, and Tra Vinh. Some other visiting sites in the Mekong Delta were at Water Supply company, agiculture farming system in Hoa An, Hau Giang, and O Mon land field as well. Additionally, we aslo visit the Bach Ma National park for learning about the accivities of charcoal project, which is carried on by the national park management team, the local government and Tokyo University of Agriculture and Technology (TUAT) for sustainable farming system in the buffer zone of the national park with improving living quality of thelocal people.

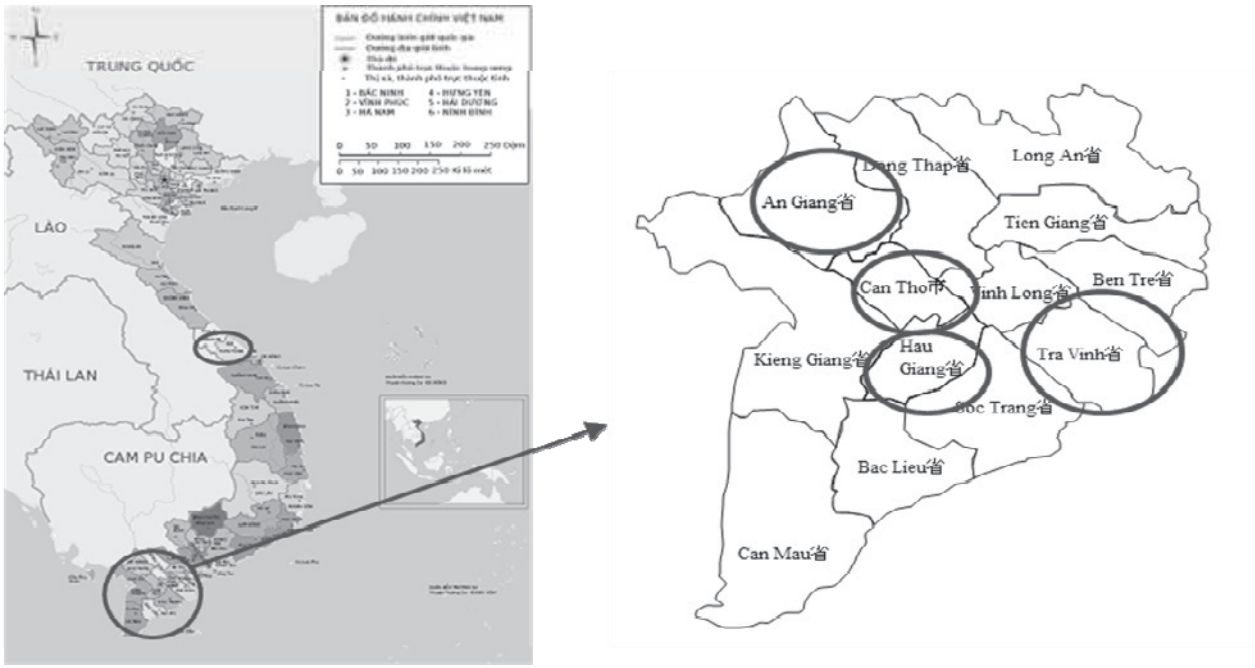

Figure 1: Map of study area in the Mekong River Delta and Hue city of Vietnam

*** Background and results of the study**

**** Study the quality of surface water of Mekong River in Vietnam**

The Mekong River Delta is the most downstream part of the Mekong River, which generally starts from Phnom Penh in Cambodia, where the river divides into two main distributing branches, the Mekong River (Song Tien) and the Bassac River (Song Hau). Mekong River Delta is not only as the main region of agricultural production, particularly food security of Vietnam, but also as a function of downstream of water use and sharing of the Mekong River system. However, this region has been facing with many issues related surface water resources; especially increasing demand and competition over water in Vietnamese Mekong Delta and amongst countries in the Mekong river basin impose hardships on the local people and leads to an inherent resource uncertainty in agriculture and aquaculture, aquatic resources exploitation, domestic water supply and water-related health problems (Dang et al., 2008). Besides, characteristics of settlement by urbanization, industrial development and agricultural production, particular aquaculture have been concentrated along the canal sites, not only Vietnamese Mekong Delta, but also other countries located along the Mekong River. These situations created some issues of competition on water among users and water pollution. Moreover, with high population and urbanization as well as low developed water management infrastructure, surface water in the Mekong Delta has been seriously polluted, which negatively influence on

public health and declining aquatic resources.

The Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa (FOLENS) has done a long term monitoring of more than 2 years, which has a significant role in providing actual states and trends of the surface water situation in both canal in the city of Can Tho and Hau river. Results shows that water quality in canal in the city in extremely organic polluted, which further exceeded the regulations for surface water, while in the main stream of Mekong river, high concentration of ammonium concentration are recorded, and the concentration of ion (like Na^+, NH_4^+, Cl^-, SO_4^{2-}) of dry season and is much higher than rainy season. However, a wider survey on the quality of surface water in the Mekong Delta which can lead to better understanding about the situation of water quality between the upstream and downstream, and between canals (which located nearby production and residential areas) and river (natural surface water) have not been enough investigated.

In this overseas field training, due to limited time, my study focused on water quality in surface water in the Mekong River in rainy season. For this purpose, surface water from 7 sites in the main stream, and 5 sub-stream of the Hau and Tien River (two main branch of the Mekong River in Vietnam) as well as at several random sampling in the drainage of various agriculture and aquaculture farming systems were collected. The sampling sites were shown in Figure 2.

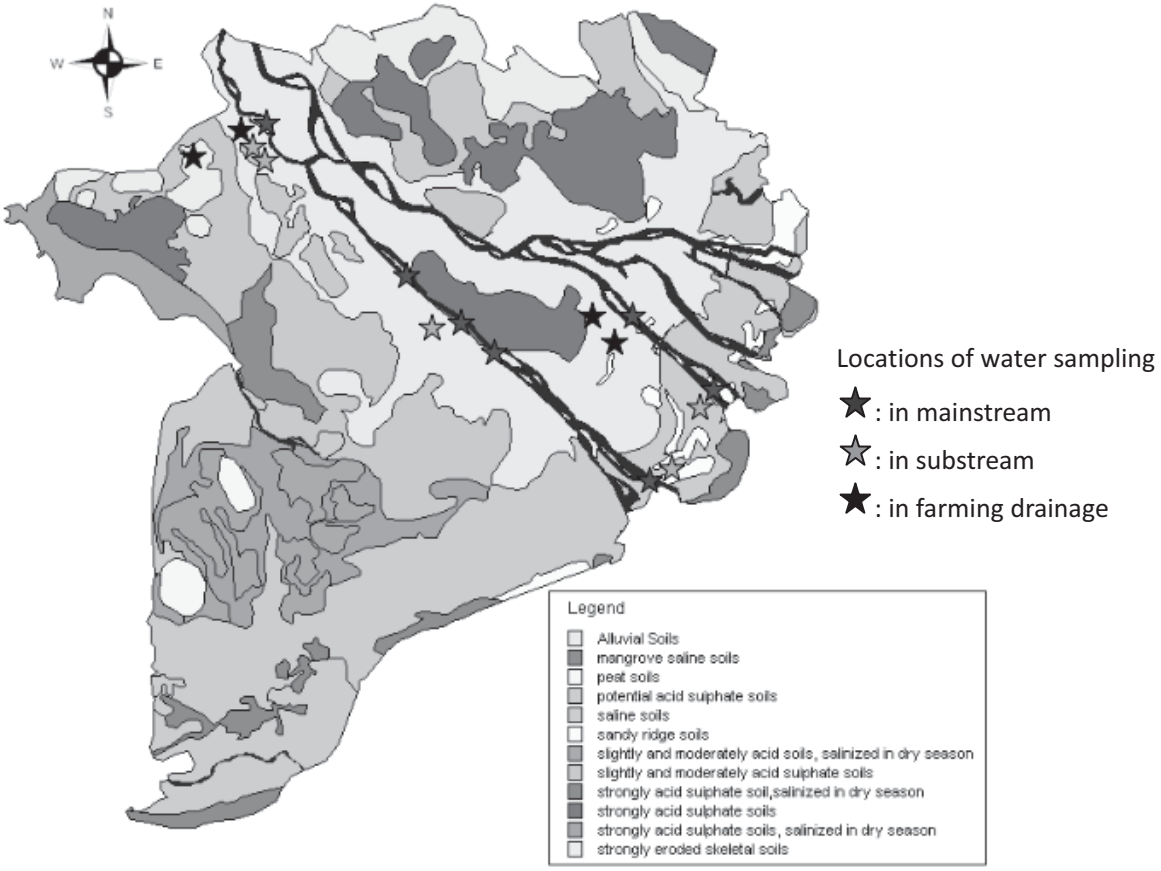

Figure 2. Sampling sites along Mekong Delta River

The water samples surveyed were collected in 3 provinces from upstream to downstream of the Hau and Tien River in An Giang, Can Tho and Tra Vinh province. The study time was in the middle of rainy

season. Water temperature, pH, and EC were measured on the collection sites, and ion concentrations of Cl^-, SO_4^{2-}, Na^+, NO_3^-, NH_4^+, PO_4^{3-}, and COD were analyzed in hotel room and laboratory on Can Tho University using portable chromometer (photoflex turb) .

Results of analyzing parameters of surface water samples are shown in below figures.

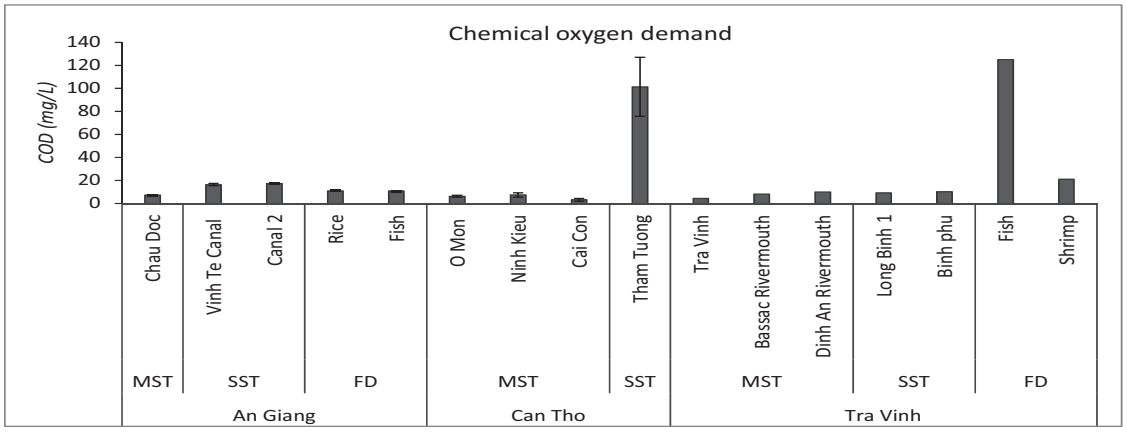

Figure 3: COD concentration of surface water samples in mainstream and substream of the Mekong river in rainy season *(Notes: MST: mainstream; SST: sub-stream; and FD: farming drainage)*

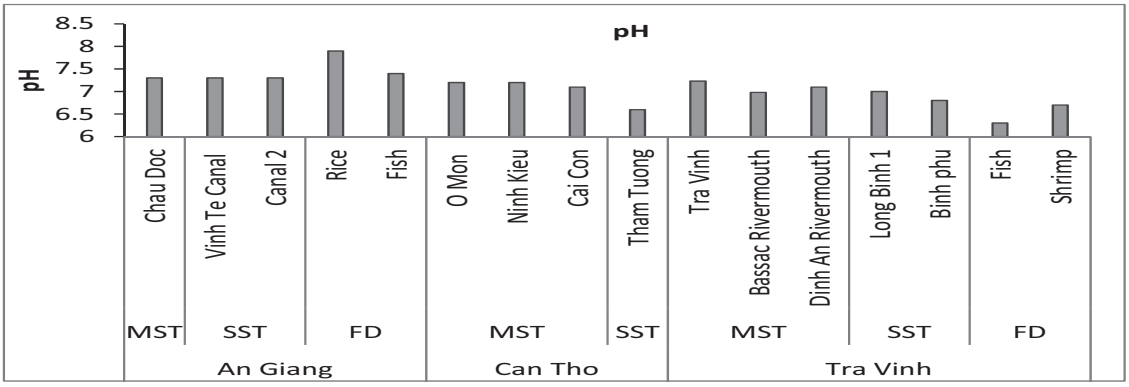

Figure 4: pH of surface water samples in mainstream and substream of the Mekong river in rainy season *(Notes: MST: mainstream; SST: sub-stream; and FD: farming drainage)*

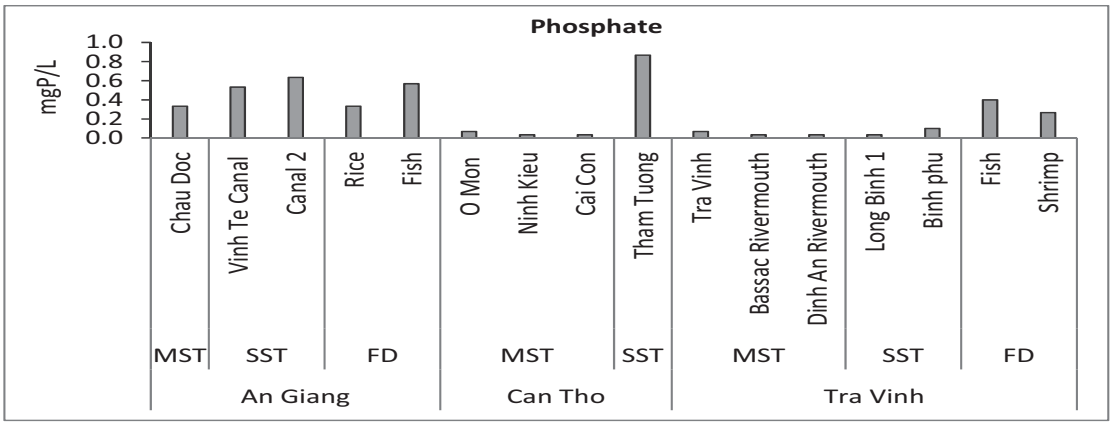

Figure 5: Phosphorus concentration of surface water samples in mainstream and sub-streams of the Mekong river in rainy season. *(Notes: MST: mainstream; SST: sub-stream; and FD: farming drainage)*

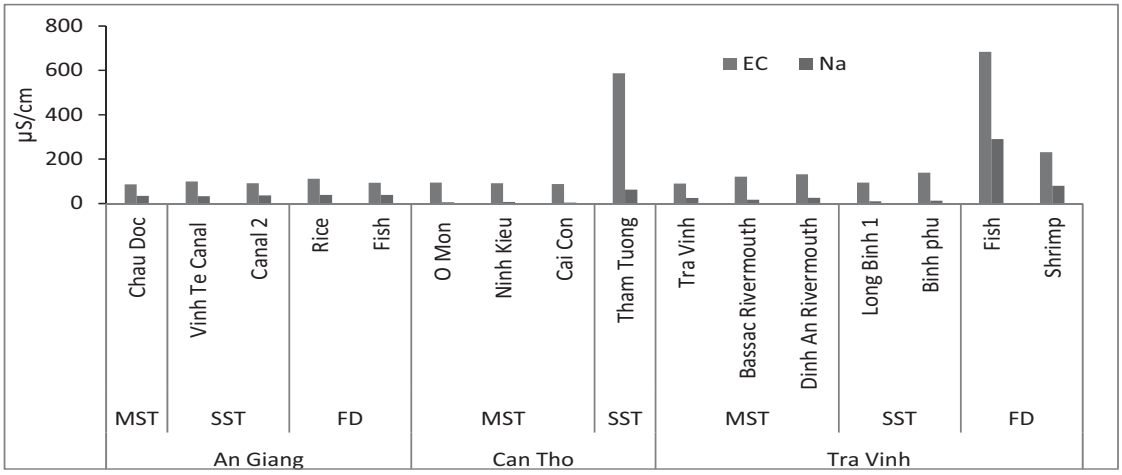

Figure 6: EC and Na^+ concentration of surface water samples in mainstream and substream of the Mekong river in rainy season *(Notes: MST: mainstream; SST: sub-stream; and FD: farming drainage)*

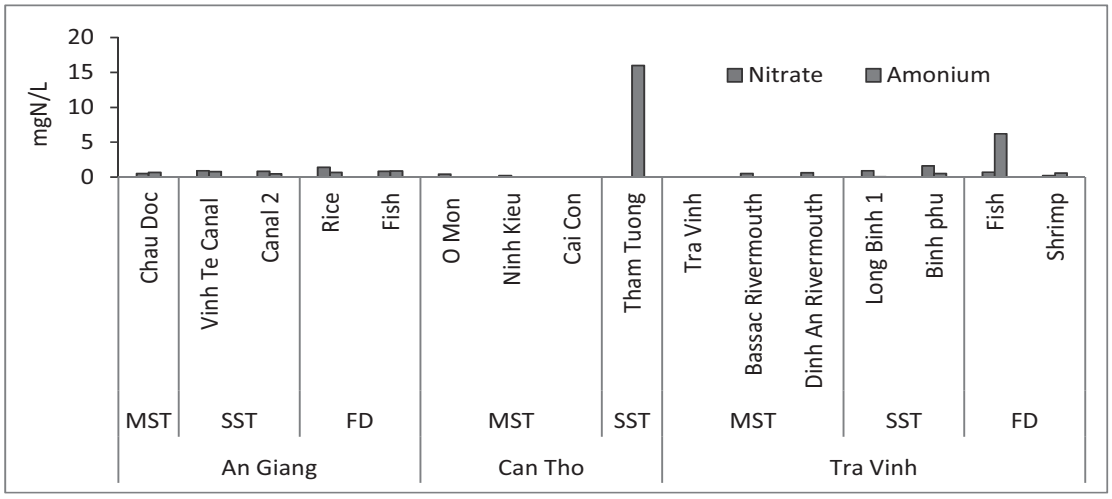

Figure 7: Nitrate and amonium concentration of surface water samples in mainstream and substreams of the Mekong river in rainy season *(Notes: MST: mainstream; SST: sub-stream; and FD: farming drainage)*

As we can see from above figures that surveyed parameters (pH, COD, NH_4^+-N, NO_3^--N, NO_2^--N, PO_4^{3-}-P) of surface water samples in Mekong River in main stream at Chau Doc, O Mon, Ninh Kieu, Cai Con and Dinh An (belong to Hau River), and Tra Vinh and Long Hoa (belong to Tien River) is below standard for surface water (QCVN08:2008/BTNMT as summarized in Table 1).

Table 1: Concentration of parameters in technical regulation surface water quality in Vietnam (QCVN08:2008/BTNMT)

Standard QCVN08	pH	COD (mg/L)	NH_4^+-N (mg/L)	NO_3^--N (mg/L)	NO_2^--N (mg/L)	PO_4^{3-}-P (mg/L)
Class A1	6.0-8.5	10	0.1	2	0.01	0.1
Class A2	6.0-8.5	15	0.2	5	0.02	0.2
Class B1	5.5-9.0	30	0.5	10	0.04	0.3
Class B2	5.5-9.0	50	1.0	15	0.05	0.5

(Note: Class A1 is standard for surface water quality used for water supply and other purposes; Class A2 is standard for water quality used for water supply with appropriate treatments; for aquatic animal and plant resources protection; Class B1: is standard for water quality used for irrigation; Class B2: is standard for water quality used for transportation and other purposes with low water quality requirements).

However, those parameters of water in sub-streams of the river were at higher level, especially sub-streams in the city area and in drainages from aquaculture farming production area. It can be explained that as sampling time was in flooded season in An Giang, flood waters, which was mainly from rainy water, could make sub-stream water diluted or less polluted. It has been known that wastewater from agriculture and aquaculture is main pollution sources in the rural area or in large scale of the Hau and Tien River. For agriculture, rice is the main crop with production of 52% of Vietnam, which was planted in more than half of total area of the delta, thus effluent waters from agriculture farming should be taken in to account for sustainable management the surface water in this area. Sampling sites at Vinh Te canal, Canal 2, Long Binh and Binh Phu, which was in rice production area, has COD value from 9.3 to 17.2 mg/L of COD. It means acceptable concentration of organic matter was in those waters (the COD value in the standard is 30mg/L for standard QCVN08 class B1 for irrigation water)

According to Nguyen et al. (2002), aquatic production plays a very important role in the Mekong Delta, which contributes about 55 % to the total aquatic production. Total culture area of the Mekong Delta has reached 724,000 ha in 2008, a 23% increase from that in 2001 (547,105 ha) (Tran et al., 2008). As well as significant contribution to the economy, this production activity also generate large amount of waste, especially wastewater. As we can see in figure 3, COD concentration in of the fish pond wastewater is at 125mg/L, which was much higher than the standard (QCVN08) about more than 12 times. Similarly, the concentration of NH4+ in this sample was especially high, at 1.2mg/L, about 5 times higher than the standard.

Similarly, the concentration of COD and ammonium nitrogen were high in Tham Tuong canal, which is located in the central area of Can Tho City, and in those of intensive fish and shrimp farming in Tra Vinh. It is clear that those sites were organic polluted by people, particularly by domestic waste water and intensive aquaculture. These waters showed high level of exceeding acceptable concentrations in the standard for surface water quality as in QCVN08:2008. It recorded remarkable high concentration of organic pollutants in Tham Tuong canal, where collecting raw domestic wastewater from its basin. It is considered that domestic wastewater shows impact on surface water. The concentration of COD and NH_4^+-N at this site is respectively

at 111.3mg/L and 62.5mg/L, which was much higher than the standard as well.

Due to the concentration of surveyed parameters, it is predicted that there is strong influence of flood water or surface natural water to the characteristics of water in the sub-streams of Hau and Tien river. Discharge of the Mekong River during the wet season averages of 39,000 m3 /sec. About 1.2 - 1.9 million of hectares of the southwestern part of the Delta is under annual flood (Le et al., 2007). Thus, it is an important which make the polluted water from high pollution area like in Tham Tuong or farming drainages well diluted.

All in all, the water quality in mainstream of the Mekong River in Vietnam (Hau and Tien river) indicated by some chemical parameter such as COD, EC, and ions concentration was within the standard for surface water in Vietnam, while those parameter of water in sub stream of the river were at higher levels, especially sub-streams in the city area and in drainages from aquaculture farming area

**** Visit Water Supply Company in Can Tho city**

This was the first time I had chance to visit the water supply company. In this place, we were introduced by the staff of the company about the procedure to treat the surface water from Can Tho River before the delivery to households. Besides, it has been mentioned by the staffs of the company that the influence of urbanization and production areas including agriculture, aquaculture, and industrial area have made the surface water quality in rivers in Can Tho city more polluted, which affected the treating procedure and technique of the company such as increasing treating time, disinfection chemicals, etc. By this chance, I can deeply understand that the surface water environment was in high pressure of pollution by impact of urbanization. The city will not completelt set up the management system for waste and wastewater, water pollution in this area in the near future because of the remarkable pollution, which finally require not only more treatment fee and techonology for surface water for supply, but also increase the risks on people's health.

**** Visit farmer house to learn about making biogas from livestock wastes in Hoa An village, Hau Giang province**

By visiting farmer in Hoa An village, Hau Giang province, I have learned about making biogas by plastic bag at household scale. This model brings a many benefit to farmers, because applying this model can increase income reduce total investments and enhance environmental condition because organic matters (as pig manure) do not pollute the surrounding environment.

**** Study at O Mon landfill in Can Tho city**

In my country, I have not visit any landfill site before, and this was my first time to visit a landfill. I was so surprised to know that the landfill was very nearby the resident area and did not seem to be managed well. We saw that the leakage from the landfill going directly to nearby canal and rice fields. I wondered if the leakage contains toxic components or pathogens, it can be dangerous to people who consume the rice and who use surface water as well. By a staff of the landfill, we also knew that there is thousands of household living nearby this landfill, and many households are concerning about the landfill because they were using surface water for family activities and receiving bad smell from the landfill as well.

**** Visit charcoal project in Bach Ma National Park**

Bach Ma national Park is one of the most popular national parks in Vietnam located in Thua Thien

Hue province. With the support from JICA, a development project namely Project for Improving rural living and nature conservation by multiple use of charcoal and wood vinegar in Bach Ma national park has been set up in Khe Su hamlet, a hamlet in buffer zone of the park. By an introduction by the project staffs and visiting local people in this area, I know that the project with many activities such as training technique for organic vegetable cultivation, pig raising, making charcoal and vinegar for organic fertilizer, as well as involving farmer with ecotourism, etc. have significantly diversify livelihood and increase income, and fertile agriculture soil and protection environment. As a result, the project also reduces the pressure on natural resource extraction in the core zone.

(2) Findings and achievements obtained, significant experiences and lessons

Knowledge and data gained from this overseas field training is especially important to my future career. My master study is about influence of nitrogen fertilizer application practices on green house gas emission from tea cultivation in Japan. This overseas field training provided me the opportunity to understand more about environmental issues in Vietnam specifically and in developing countries generally. I have visited many study sites that I have not had chance before. On the other hand, I have learned that we should plan and arrange our works in oversea training appropriately. It is important to do the work that we had planned in a limited time.

(3) Achievements and its future vision

Field experience is an opportunity for us to practical experiened by acting as consultants and solving actual environmental problems. I am really interested in water quality. I hope that I can get some knowledge about water quality issue, which gives me additional skills and experiences of working with many situations in future works, especially sampling and analyzing water samples characters.

As we know, environmental protection is one of the urgent problems facing mankind today. What are the reasons for environmental problems? First, the wasteful consumption of natural resources and destruction of ecology are caused by humankind's psychological craving for convenience and wealth. We should develop environmental awareness cherishing natural resources, protecting the ecological environment, and lifestyle choices such as reducing the amount of garbage, recycling, living a pure, simple, and, frugal life, and minimizing the pollution we produce.

Another reason I would like to talk is that many of us know that we should protect our living environment. However, it is easy to talk but not easy to do. We are studying about environmental problems, meanwhile do we really act environmental friendly? The answer is not always yes as many of us still waste energy and causing various kinds of pollution every day.

I think it’s important to be environmental friendly more practically, from saving drops of water, less using elevator, etc. I always remind myself of this thought: there are many people are lacking of necessaries such as water, food, and energy and that threatens their survivals, what I can I do for them? I am trying to live simpler and more environmental friendly than myself before. I will try to lead myself well first and then

would become possible to be a qualified environmental leader later.

(4) Acknowledgement

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(Supervised by Assist. Prof. Ozaki Hirokazu and Assoc. Prof. Kimura Sonoko Dorothea)

Report of Overseas Field Training
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Tokyo University of Agriculture and Technology

Survey microbial water quality and prevalence of diarrheal pathogens of surface water in the Mekong delta, Vietnam

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Destination and period: Vietnam, September 3–29, 2012

Key words: water pollution, coliform, *E. coli*, Enterotoxigenic *Escherichia coli* (ETEC), parasite

Abstract

The Mekong Delta is one of the biggest and most fertile deltas in South East Asia. Fast economic development combined with weak wastewater management practices is continuously polluting of water quality in the Mekong Delta (MD). This is placing additional stress on the significantly high prevalence of waterborne diseases in the region. The pollution of water with human and animal waste is a source of hazardous pathogens and contamination of natural water bodies poses a serious health risk. This study was carried out to survey the microbial water quality of surface water in the Mekong delta Vietnam, especially the impact of livestock production on the water pollution. Total amounts of coliform and *Escherichia coli* used as indicators of water contamination. Enterotoxigenic *Echerichia coli*(ETEC) was surveyed to assess the transmittance of diarrhea pathogen in surface water in MD. Water samples were collected from 4 canal (Hai canal, Vinh Te canal, Que canal and Hem Bay canal), 3 sites of Hau river in An Giang province, Can Tho city and one lake water sample in Can Tho city, which were affected by domestic and agricultural discharge. Additionally, waste water samples were collected in 3 farms in Hau Giang province and Can Tho city for estimation of microbial pollution load of livestock production. The result showed the water sources from canal, river and lake in urban area and near livestock farms were highly contaminated with coliform and *E.coli*. No enterotoxigenic *E.coli* pathogen was found in tested area at surveyed time. Quantitative results revealed the presence of pathogenic organisms and water quality risk factors due to bad hygiene behavior and poor sanitation in urban area and livestock production. Continued water quality monitoring, good wastewater management, and healthy domestic hygiene practices were highly recommended.

Activities during the overseas field training

On September 3, 2012, we started the overseas field training course in Vietnam. The destinations were the Mekong delta (southern part of Vietnam) and Bach Ma buffer zone (the middle of Vietnam). The counterparts were Can Tho University, Bach Ma National park and Hue University of Agriculture and Forestry. Our field training was supported by Dr. Nguyen Van Be from Can Tho University, Prof. Oikawa Yosei and Ms. Shii Kyoko from Bach Ma project, Prof. Ho Trung Thong from Hue university of Agriculture and Forestry. We were under kind guidance of the staff from Tokyo University of Agriculture and Technology, Prof. Yoneda Kenichi, Prof. Hayashidani Hideki, Prof. Tarao Mitsunori, and Prof. Ozaki Hirokaku. In this field training, I chose the topic "Survey microbial water quality and prevalence of diarrheal pathogens of surface water in the Mekong delta, Vietnam" to gain practical experience and understand environmental issues in the Mekong delta and Vietnam country.

The Mekong Delta of Vietnam (MD) is formed by the lower part of the Mekong river, located in southwestern and known as "rice bowl" of Vietnam. It is one of the most productive agricultural areas of the world and related to a great river of Asia so it attracted much international attention. In recent days, because of population pressures, increasing acidification of soils and changes in Mekong's flow, environmental problems in Mekong delta have intensified. The training was prepared to study about the environmental issues, the human impact on environment, and the eco-social condition in Mekong delta as well as Vietnam in general. Within 9 days-field training in Mekong Delta, we conducted on-site practices and laboratory work at Can Tho University. The first day we went to the upstream of Mekong and visited Sam mountain, Chau Doc, An Giang. We collected samples in some different site of the water bodies on the way to Sam mountain. Water samples were checked directly by pH, temperature, electrical conductivity, and the other criteria *E.coli*, coliform, anion, cation…were analysed in laboratory. On the way, we visited a model farm, which called multi-purpose pond, managed by a scientist of Can Tho University. It was considered for sustainable farming method adapted with flood condition in An Giang province. With this model, crop cultivation was done in dry season with enough pond water and no irrigation from outside and prevent submerged when flood came. We got the Sam mountain top and observed the whole view of Mekong delta at beginning of flood season. We could see the difference views between outside and inside of the dikes, farmer could do rice cultivation inside the protect area while outside were already filled up by flood water. The impact of upstream development was introduced by a hydrologist scientist of Can Tho University, Dr. Tri, he gave us good lecture about the dyke systems, advantages, disadvantages and impact of dike construction on natural environment of the Mekong delta.

The next day, we visited VACB farm (10 kilometers from Can Tho city), the Bio-diversity Research and Experimental Center of Can Tho University. VACB system (VAC stands for *Vuon,* Vietnamese for garden and orchard; *Ao*, pond; and pigpen and hen coop; B, biodigester), a farm model that the output from one sub-system (e.g. faeces from pigs and ducks) become the direct input of other sub-system (e.g. as feed for fishes), and as organic fertilizer for plants in the garden. VACB farm become popular in rural area of Vietnam now. In the Mekong delta, the VACB system has been producing sustainable agricultural products while safe-keeping the environment. The Bio-diversity Research and

Experimental Center belonged to Can Tho University, which carries out education, research and extension to solve the scientific practical problems for sustainable rural development in the Mekong delta, has attempted to preserve the natural condition of local forest and decrease risk of acidification of soil, one of the environmental problems in the Mekong delta.

One of our concerns in this trip was microbial water quality of surface water in MD. The greatest microbial risks were associated with ingestion of water that is contaminated with human or animal feces. Wastewater discharges in surface waters was the major source of fecal microorganisms, including pathogens. Among many microbial pollution resources, livestock production seemed one of the main causes of this contamination. The microbial pathogens from livestock production can be mobilized from land-applied manure or directly fecal waste to surface water and pose a threat to human health. On the other hand, water pollution, bad hygiene condition will lead to transmit infectious disease in animal farms thus caused economic loss for the farmers in livestock production. In order to evaluate the risk of microbial contamination of surface water in Mekong delta we attempted to detect *E.coli*, total coliform and Enterotoxigenic *Echerichia.coli* (ETEC) in water samples collected at river, canal and pig farm sites. The presence of total coliform bacteria and *E.coli* indicated the presence of fecal pollution. Water supply may be vulnerable to contamination by more harmful microorganisms. Enterotoxigenic *Escherichia coli*, or ETEC, a group of *E. coli* that produces special toxins, causes diarrhea disease can transmitted via contaminated water. ETEC was recognized as a cause of human and also animal diarrhea disease. Among the pathogenic *E.coli* types, ETEC has been isolated from drinking and surface water samples (Yasmin et al., 2005). This is probably due to the risk of animal-derived EHEC in runoff from agricultural land into watercourses.

Fourteen surface water samples were collected in canal, Hau river, lake in An Giang province, Hau Giang province and Can Tho city. Two wastewater samples and one ground water were taken in two pig farms in Can Tho city. The sampling sites and result is shown in Table 1. *E.coli* and total coliforms were analyzed using portable Petrifilm^{TM} plates, manufactured by 3M Microbiology, USA. One mL of water sample was added to the Petrifilm and spread evenly over the agar area. Petrifilms were incubated at 37ºC for 24 h. Blue colonies with entrapped gas were counted as *E.coli* and a sum of blue colonies with gas and purple colonies associated with gas – as total coliforms. Enterotoxigenic *Escherichia coli* (ETEC) detection in water samples was done by PCR analysis. One-hundred ml of water samples were collected and centrifuged. Water sample were applied to DNA extraction by QIAamp®DNA Stool Mini Kit. Three DNA virulence genes, LT, STa, STa, were checked for detecting ETEC in the water samples by PCR method.

The oversea field training was continued to Bach Ma buffer zone, surrounded by Bach Ma national park, Thua Thien Hue province. We visited Bach Ma project office and learnt project activities. This project transfer appropriate charcoal technology for improving agriculture and animal husbandry to the farmers. Charcoal from rice husk, sawdust, plantation trees were used as organic fertilizer by composting with regional biomass (manure, rice brain, agro-wastes). Using this organic fertilizer could improve poor soil for growing healthy vegetables. Charcoal and vinegar can prevent diarrhea of livestock by feeding, deodorize animal pen and make good quality compost. By visiting some local people's farm, listening and

talking with famers, we learnt that the techniques of this project were applied effectively to the local households. The farmer produced “green” products, got incomes and the importance thing was doing environment friendly farming. We practiced to make charcoal and vinegar with farmers and share opinions on sustainable agricultural development each other. That was a nice experience to all of us.

We heard that the Bach Ma charcoal project was in final stage. Sustainable farming activities will be maintained and promoted after project finish. The project activities should be combinated with Bach Ma national park to develop livelihoods in buffer zone and natural forest protection. Besides agriculture, this area also has potential of ecotourism development because it was near national park, a famous visiting place of nation. Ecotourism is an opportunity for the local people living in this region to gain positive benefits from tourism development and the conservation of forest and protect area. Ecotourism-base on community is most suitable for buffer zone. Some ideas for ecotourism development such as: training about ecotourism to local farmers, promote organic farming with project technologies, the medicinal plant naturally growing in the region, making and selling local traditional handicraft, opening family restaurant and served safe local products to visitors, opening tour of visitor joining farm work...Local government should support for ecotourism activities and marketing for these activities are very important and necessary for ecotourism development in buffer zone.

After finished field training with FOLENS group, I prolonged my staying in Hue city for own study research. I examined the presence of parasite pathogen which causes diarrhea piglet in feces by using microscopically method. The experiment was conducted in central laboratory of Faculty of Animal Science, Hue agricultural and Forestry.

Findings and achievements obtained, significant experiences and lesson

Table 1: Total number of coliforms and *E.coli* in water samples.

	Sampling site	Code	Coliforms (cfu/100ml)	*E.coli* (cfu/100ml)
1.	Hai canal, Chau Phu, An Giang, effluent branch	C1	7200	2300
2.	Hai canal , Chau Phu, An Giang	C2	5700	600
3.	Hai canal, fish pond effluent	C3	3700	300
4.	Vinh Te canal, upstream, Tinh Bien, An Giang	C4	10600	1400
5.	Vinh Te canal, downstream, Tinh Bien, An Giang	C5	12300	1000
6.	Que canal, Phung Hiep, Hau Giang	C6	36000	5900
7.	Hem Bay canal, Binh Thuy, Can Tho	C7	43900	7800
8.	Hau river, triple branch, An Giang	H1	3600	700
9.	Hau river, Chau Phu, An Giang	H2	8500	1000
10.	Hau river, Long Xuyen, An Giang	H3	11000	900
11.	Hau river, Can Tho city	H4	26500	2600
12.	Natural fish pond, Chau Phu, An Giang	P	2600	200
13.	Paddy field, inside protect area, Chau Phu, An Giang	F	8600	2000

14.	VACB farm, Hoa An, Phung Hiep, Hau Giang	F1	44700	2400
15.	Xang Thoi lake, Can Tho	L	27300	3300
16.	Pig farm 1, waste water, Binh Thuy, Can Tho	F2	$>10^7$	$>10^7$
17.	Pig farm 2 waste water, Binh Thuy, Can Tho	F3	$>10^7$	$>10^7$
18.	Pig farm 1 drinking water, Binh Thuy, Can Tho	G	0	0

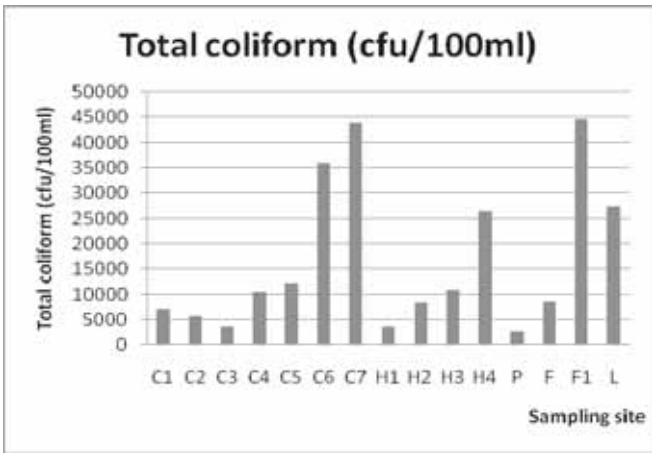

Figure 1: Density of total coliform in water samples.

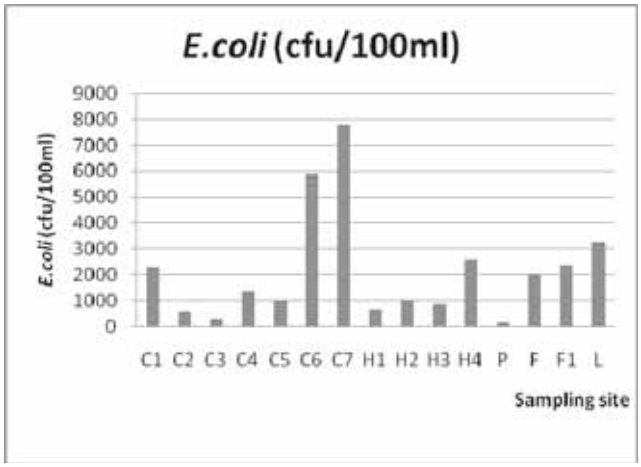

Figure 2: Density of *E.coli* in water samples.

In this study, we surveyed amount of total coliform, *E.coli* and ETEC in seven sites of 4 canals in Mekong delta. Hai canal and Vinh Te canal were main canals in the rural area of the Mekong Delta. Que canal and Hem Bay canal were in the urban area of MD. Larger amount of total coliform and *E.coli* were found in 4 out of seven canal sampling sites, the highest amount was at Hem Bay canal, total coliform (43900 cfu/100ml) and *E.coli* (7800 cfu/100ml), followed by Que canal (total coliform 36000 cfu/100ml, *E.coli* 5900 cfu/100ml). These values exceeded limit of national standards 10000 MPN/100ml (National Technical Regulation on Surface Water 2008/BTNMT - QCVN 08, B2 type for water transportation and other purposes which can be relatively low quality). These two canals receive discharge from households, some small pig farms around Can Tho city and Hau Giang province. We felt bad smell and black color from the canals. The high density of population and livestock production activities might cause microbial pollution in these canals.

The water samples collected from Hau river, one of mainstreams of Mekong river, were also checked for microbial water quality. The river sampling sites were mainly in An Giang province and Can Tho city. Coliform were detected lowest at triple branch of Hau river (3600 cfu/100ml), An Giang province and highest near Can Tho city (26500 cfu/100ml), exceeding the limit of the current National Technical Regulation for the surface water quality (QCVN08:2008, type A1). The microbial contamination of the larger river branches was significantly low (3600 cfu/100ml) because the flow volume is large. The much polluted Hau river water nearby the city might be affected heavily by domestic activities in the urban area.

One polluted site was Xang Thoi Lake in Can Tho city. The coliform and *E.coli* were much highly detected (27300 cfu/100ml and 3300 cfu/100ml), indicating that the lake was polluted with

microorganism. Recently, the city government has an attempt to clean up the lake but it was still polluted due to the pressure of urban life.

The discharge water from a VACB farm in Hau Giang province contained high amounts of coliform and also *E.coli*, exceeded the limit of the standard for wastewater (TCVN 5945: 2005). It might be the reason for microbial contamination of the Que canal nearby.

The ground water collected in a small pig farm in Can Tho city showed no coliform and *E.coli* (site No.18 in Table 1). The farm had a small scale tube well to withdraw the ground water and used as drinking water for pig rising. The result indicated the ground water source there still clean, not contaminated with harmful microorganism.

In this study we try to detect ETEC in waste water of two mall pig farms in Can Tho city and all samples in study sites. The result showed no ETEC detected in such samples. It indicated that ETEC might exist in water samples but the density was very low to be detected or ETEC cannot survive for long time in water environment. At the survey time the pigs of those farms were not get diarrhea and ETEC was not prevalent in these two farms. It is necessary to do further survey at certain place and time to know clearly about the prevalence of ETEC in aquatic environment.

This work investigated the microbial contamination of numerous water bodies in the Mekong delta, including rivers and canals, spanning the urban and rural environment. Among the surveyed river and canal sites in the Mekong Delta, over 50% of sites were respectively exceeded total coliform limits of 10000 cfu/100 ml and *E.coli* limit of 1000cfu/100 ml in Vietnamese Standard for surface water quality (QCVN 08:2008, B2) . The results showed that the poor quality of the Hau river and Xang Thoi lake in Can Tho city was strongly related to human activity and animal husbandry. The microbial water quality of the canals was also influenced of household and agricultural activities. These were potentially a threat to human health and action should be taken to remediate and improve the manner in which discharges are made into local river and canal waters that are accessible to the public.

Besides basic skills acquired in practical study, we observed and learnt about society, economic and agriculture condition of local community in the delta. The Mekong Delta has potential to develop agricultural production, especially rice culture. On one hand, agricultural production has developed successfully, economic growth has been very rapid, but the other hand, population pressure, intensified agriculture and large-scale water-control structures have changed the environment. We learnt that the dyke systems have practically guarantee safety for agricultural livelihood but also have negative impact become threat in term of water pollution, natural fish exhaustion, soil fertility reduction… Thus the dyke system construction and planning as well as implementation strategies need to be studied further to minimize the negative impact of dyke systems. We found an active effort of Can Tho University in cooperation with international scientists, organizations to carry out many good researches on the Mekong delta so we do hope the delta will be sustainability developed in the future.

Through this field training we gained many valuable experiences. We had chances to visit many places, communicated with Vietnamese and Japanese researchers, students, local people and we learnt a lot from them. We conducted field research with own ideas but we always work in a group, helped together, shared opinion and discussed interest issues. Our Folens student group had co-work with CTU students.

They were very active and enthusiastic in every training activity. Therefore participants had a better understanding of environmental issues in Mekong delta, about Folens's activities in Can Tho University, and tighten the relationship between two university.

My own research study was done in Hue university of Agricultural and Forestry. Fecal samples from 205 diarrhea piglets were examined for parasite. Cryptosporidium parvum, one typical of parasite caused diarrhea in piglet, was found at 22.9% of examined samples collected in rainy season and 17% of samples in dry season. The result will be combined with further study to clearly understand of the pathogen cause piglet diarrhea in the middle of Vietnam.

Achievements and its future vision

This oversea field training is one of the most useful learning that provides student understanding problems (environmental pollution, culture, society...) as well as touching reality of the life especially in rural areas of Vietnam. Through the training, we knew the challenges that the Mekong Delta has to face: aquatic resources are becoming exhausted; industrial and household waste remains untreated; fields salinity penetration; flood, drought, and the impact of climate change is increasingly complicated. It is necessary to pay attention to effective and sustainable use of natural resources. Fast economic development combined with weak wastewater management practices is continuously polluting water quality in the Mekong Delta. It led significantly high prevalence of waterborne diseases in the region such as diarrhea, cholera and typhoid. Health education levels, hygienic behavior standards and sanitation infrastructure are often inadequate to address and tackle issues of that kind in a preventive manner. Besides, to utilize water resources effectively in circumstances of climate change, it is necessary to work out irrigation strategies based on natural conditions. We supposed that it is necessary to develop infrastructure in association with science and technology, tighten the linkage between the local government, farmers, scientists and businesses, and make appropriate plans for agricultural development.

Working on animal science field, I learn how impacts of livestock production to environment. Besides effective livestock production we should find proper technologies to mitigate the negative effects and maximize the positive effects of different modes of production and assesses ways to enhance their development and adoption. The field-oriented mind and scientific understanding about environment are very necessary for my future career as a role of field-oriented leader in my country.

Acknowledgement

I would like to thank Dr Be, Dr Tri, Dr Tuyen and Ms Nam from Can Tho University for their supporting our field training. I would like to express my sincere gratitude to Prof. Hayashidani and Prof. Ho Trung Thong, Prof. Ozaki for encouragement and enthusiastic support during my training in Can Tho and Hue city. I greatly appreciated the help provided for the laboratory work at Dr. Khai's laboratory, Department of Veterinary Medicine, Central lab, Faculty of Animal Science, Hue University of Agricultural and Forestry and the staff. I would like to thank greatly Prof. Oikawa, Mrs. Shii and staff of

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Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Biological interaction of plants in Agroforestry system in Tomé-Açu

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Destination and period: Tomé-Açu, Brazil. 9, Sep., 2013 - 9, Oct., 2013

Key words: successional agroforestry system, allelopathy, traditional agriculture, useful plants,

Abstract (approximately 200 words)

Tomé-Açu is the oldest the Japanese settlement in Brazilian Amazon. In 1950s, the black pepper grew well with application of chemical fertilizers. However, the international market price declines, the Fusarium disease spread, and the flood damaged the black pepper plants. So they had converted into Agroforestry system from monoculture. Japanese Brazilian (Nikkei) has developed unique agroforestry system (SAFTA). The purpose of my activity is learning "Field oriented leader skill" in local area, learning practical attempts by farmer, and finding the potentials of agroforestry systems. For finding the potentials, plants were collected from the agroforestry system and screening their allelopathic potential were conducted by using "Sand witch method". In this experiment, some plants showed allelopathic activity and this implied these plants have potential to utilize various way. And through this field work in Tomé-Açu, I learnt the importance of going to field and learning from local people. Returning our research result to local people is also very important. We cannot stand in the same view point with local people in only lab. And for understanding local situation, we need communication skill. When we consider for local people in real earnest, it is easy to open up to local people. In the future, I would like to think what I can do for local people and return my experience in Tomé-Açu.

(1) Contents and activities during the overseas field training (less than 600 words)

Title of this activity is "Biological interaction of plants in Agroforestry system in Tomé-Açu". And I was supported by two counterparts, Cooperativa Agrícola Mista de Tomé-Açu (CAMTA) and São Paulo State University (UNESP), and my supervisor Prof. Yoshiharu Fujii.

Schedule is below.

9 Sep. Tokyo → São Paulo

10 Sep. São Paulo → Belém

10 Sep. – 13 Sep. Tomé-Açu

Field survey; Questionnaire investigation, Interview and sampling

14 Sep. – 16 Sep. Igarape-Acu

Field survey; Questionnaire investigation, Interview and sampling

16 Sep.－21 Sep. Belém The meeting with counterpart, interview

22 Sep.－28 Sep. Tomé-Açu

Field surey; Questionnaire investigation, Interview and sampling

29 Sep. Belém the meeting with counterpart

30 Sep. São Paulo transfer

1 Oct. – 5. Oct. Botucatu

Screening of plants, free survey in UNESP

6 Oct. the meeting in São Paulo

7 Oct. – 9 Oct. São Paulo → Tokyo

The activity site is the Japanese settlement and many Japanese Brazilian (Nikkei) live there. The climate is very difficult between Japan and Brazilian amazon. The immigrants who settled from 1928th did not know local culture and how to survive in tropical jungle and cultivate tropical crops. Unfortunately the situation of World War II was very bad. That is why, the immigrant life was very hard in the beginning (Nishizawa et al., 2012). In 1950s, the black pepper grew well with application of chemical fertilizer. However, the international market price declined, the Fusarium disease spread, and the flood damaged the black pepper plants (Kishimoto and Ishibata, 1996). On the other hands, mass deforestation has resulted from a sequence of road building and pasture developing in the Brazilan Amazon. Because of those bad situations and promoting deforestation, the immigrants have developed unique agroforestry system (Yamada and Gholz, 2001).

In this field activity, to figure out sustainable agriculture, my activity has 3 contents. One is finding the potentials of agroforestry system. The farmers have developed agroforestry with focus on competition for sunlight, water and nutrients. But there is little focus on biological interaction. The results of biological interaction can bring the allelopathic potential of Brazilian plants, which can be first step in the research of proof and improvement of agroforestry system. The second one is learning practical attempts by farmer. Every farmer try to develop their agricultural system and I had chances to see their unique system. The third one is learning about “field oriented leader” from the Japanese immigrants. I visited a Nikkei agricultural cooperative in Tomé-Açu. I had interview and attended workshop. And I met some leaders in the local area. In Tomé-Açu, some Japanese Brazilian trains smallholders. They train various aspects, the skill of farming, how to manage their farming system and life style.

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

The real situation is learned in just only field. My master study field is agronomy, but I should learn not only technical skill but also market, the idea of farmer, local life style and culture. When we try to adapt our result of our research, from only technical skill, it would not work well. The reason why local leader can train smallholder is that they know real situation and they can find the solution in the view point of local people. This local view point is very important thing for my master study.

My activity has the 3 contents mentioned above.

From first content, I could get knowledge of useful plants. Many plants have potential to develop agroforestry system more ecofriendly. Some plants inhibit growing of another plant. This plants have this effect can be organic herbicide. And from second content, I could learn one of the important things when we consider how to adapt the technical skill. I could know every farmer, not the scientist, is the expert of agriculture. They consider how to develop their farming. They must make a living in farming. The farmer would like to get high yield and to do easy way. They must think cost. This balance is important. When we find the easy way but if it takes high cost, it does not work well. And finally, from third one, I could learn human resource is needed in sustainable agriculture not only technical skill and economy. Through this field work, I learned the best situation to develop human resource is in family. The father train their son and daughter. And some local leader and agricultural cooperative that train smallholder is also best situation. Thanks to this succession, the unique and eco-friendly way is sustainable.

Through my field activity, I felt I would like to meet Japanese local field oriented leader. Learning from them, I can understand the problem each area has.

(3) Achievements and its future vision (less than 400 words)

Through my activity, I learnt the important point of field oriented leader.

First is the importance of going to field and learning from local people. We cannot get real information in just only lab. The local people have the key to solve the problem. This key is, for example, finding the simple and small problems. In only lab, scientist can find bad situation, but they cannot find what is problem and what happen in the field. To help local people, we researcher can use. Not only scientists solve the local problem. Second one is conducting research. Extent of effort by the local farmers could be limited, good point that we research in the field is we have technical skill to develop. This combination is very important. For this, we need ability of making network and communication skill. We should think every factor, but it is difficult for only one person to do it so we need think the solution with various people. Third is sharing information. Education and human resource development is important for sustainability. And our result should be shared with local people. Always our result has to be for a benefit every people not for only researchers.

When we try to contribute to environmental problems and international cooperation, we need communication because we do not know the real situation.

(4) Acknowledgement

I am deeply grateful to Mr. Michinori Konagano, Mr. Wataru Sakaguchi and Mr. Hitoshi Saiki, the head of Cooperativa Agricola Mista de Tomé-Açu. And I would like to express my gratitude to Prof. Velini and Mr. Tiago in UNESP. Finally, Special thanks also to Prof. Yoshiharu Fujii, Prof. Masaaki Yamada, Mr. Helio Makoto Umemura, and teachers and staff of FOLENS.

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(Supervised by Yoshiharu Fujii)

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Current situation of cultivation methodologies for horticultural crops in rainy season between Mekong delta and Bach Ma National Park focused on the balance of advanced agricultural technologies and environmental consciousness

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Destination and Period: Can Tho and Hue, Vietnam, From 13th October to 20th October in 2012

Key Words: Rainy season, Cultivation methodology and technology, Horticultural crops, Rice husk Charcoal, Bokashi-Tan

Abstract

The feature of organic farming in Bach Ma National Park (BMNP) , Hue is safe and healthy agroforestory for human life and also environmental-friendly production. However, the organic farming is low production efficiency and income from organic farming and moreover, they have no work in rainy season because of heavy rain. The objective of this field training is to understand the cultivation methodology and technologies of horticultural crops in rainy season in Vietnam in order to offer an information to the residents in BMNP through the field observations in Mekong Delta (MD), Can Tho as a guide, where is the most famous for agri-production in Vietnam. The cultivation technologies of horticultural crops in MD did not seem different from those in BNMP. The methodology of cultivation was only quite different from those in BNMP because of environmental condition and cultivation scale. The common issues on cultivation in MD were the cost of chemical fertilizer and damage to products by pest and disease. The technology of making the "Rice husk charcoal" and "Bokashi-Tan" on BNMP Project attracted an interest by professors and students in Can Tho University. Because there was enough materials for making charcoal in MD and this technology would contribute to the cost reduction of the chemical fertilizer purchase. As a conclusion, it could not be observed something to offer the information of cultivation technologies of horticultural crops in rainy season to the farmers in BNMP on this field training. However, making ‘Rice husk charcoal’ and ‘Bokashi-Tan’ were comprehended one of the mutual technologies. As the solution to increase the productions in rainy season, making organization and the appropriate spray of pesticide would be needed if they want to increase the products and income from organic farming in rainy season.

(1) Contents and activities during the overseas field training

✓ Title of the field training:
Current situation of cultivation methodologies for horticultural crops in rainy season in Mekong delta and Bach Ma National Park focused on the balance of advanced agricultural technologies and environmental consciousness

✓ Supervisor: Professor Ogiwara Isao

✓ Counterparts: Doctor Thu, Can Tho University & Doctor. Hien, Can Tho University

✓ Schedule

Date	Place	Field visit	Activities	Aim
13th Oct	--------	-------	-------	
14th Oct	Can Tho	Pomelo Orchard	Field Observation	To find cultivation methodology and technologies of horticultural crops in rainy season
	Can Tho	Vege Organization	Field Observation	
15th Oct	Can Tho	Can Tho University	Introduction of making rice husk charcoal and Bokashi-Tan	To introduce the Project activities in BMNP
16th Oct	Hue	Keshu Hamlet BMNP	Meeting: Introduction of the situation of cultivation in rainy season in MD	Lectured by Dr. Thu and Dr. Hien To inform the situation of the cultivation in rainy season in MD
17th Oct	Hue	Keshu Hamlet buffer zone in BMNP	Field Observations	To observe the aspect of cultivation of horticultural crops in rainy season in BMNP and the Project activities of making 'Rice husk charcoal' and 'Bokashi-Tan'
18th Oct	Hue	Bach Ma National Park	Go to Bach Ma Mountain	To observe the environmental conditions

✓ Background and Purpose

The current situation in BNMP, residents who live in buffer zone in BNMP try to replace timber work with organic farming concerning environments by JICA and other donors' supports (Fig.1). But it is low production and income from organic farming (Graduate School of Agriculture, Tokyo University of Agriculture and Technology, 2011). Moreover, they do not have any job in rainy season if they quit timber work and adopt organic farming because of heavy rain (Shaw, 2006). If it were possible to cultivate horticultural crops in rainy season in BMNP, they would gain a little money during rainy season what I expected.

MD was selected as a object region for this field training to find cultivation methodology and

technologies of horticultural crops in rainy season. Mekong delta is located in southern Vietnam. Rice which is the staple crop of Vietnam is actively produced there, and it occupies more than fifty percent of the whole Vietnam's production. However, the more produced rice, the lower income from the rice products because of downward of rice price. So, recently, the products of the horticultural crops such as Mangoes and Citrus are increased as the new resource of income instead of rice by the export of the products and green tourisms (Ohira et al., 2005). How do they successfully manage the horticultural production in the rainy season? I expected that there might be some technologies and methodology on cultivation there.

Fig.1. View of Acacia plantation.
Residents who live in the BMNP buffer zone mainly earn a living by timber cutting.

(2) Findings and achievements obtained, significant experiences and lessons

On this field observation in MD, specific information on the cultivation technologies of horticultural crops to transfer to rainy season in BMNP were not obtained. The application of mix cropping and crop rotations was seen both in MD and BMNP field easily. The cultivation methodology was naturally quite different between MD and BNMP because of different environmental and land conditions. In MD, Watering system on agriculture was developed by making water channel around farmland through the river and the cultivation varieties were differ depending on water level under large scale, while In BMNP, Making rice husk charcoal and bokashi-tan and organic farming were actively conducted on small scale like home garden. The differences on the cultivation techniques of horticultural crops scarcely observed on the both different field. Cultivating horticultural crops in rainy season seems that it requires more techniques and knowledge than dry season due to serious damages of pest and disease during the rainy season.

However, some differences on management between MD and BMNP were observed on this field training. In case of MD, the both two sites, Pomel orchard and vegetable organization were formed the organization like farmers group. They established the roots of selling products by participating in Good Agriculture Practice (GAP) and contracting with company. So, they have a plan to provide the products every season and the one of the members who has experience and techniques works to advise to other members as expert by communicating within the group.

Furthermore, as the most interested episode in this field training, the technologies of making 'Rice husk charcoal' and 'Bokashi-Tan' were impressed students and professors at Can Tho University when Dr. Oikawa introduced the activities of the Project in BMNP (Fig.2, 3, 4). It was considered that this technology have a potential to offer improvement on some issues, such as cost of fertilizers and disposal of the plenty of residues of the productions after harvesting, the bottleneck in production for farmers in MD. These technologies, 'Rice husk charcoal' and 'Bokashi-Tan' could have the potential to be applied to any where

without being affected by environmental conditions and other factors.

Fig.2. Making Rice-husk charcoal.

Fig.3. Materials for making Bokashi-tan. Ferment Rice bran(A), Rice-husk charcoal(B), Manure(C) and Bokashi-Tan(D)

Fig.4. Introduction of Making Rice-husk charcoal and Bokashi-Tan at Can Tho University

It is considered that farmers in BMNP only don't have enough experiences on cultivation of horticultural crops in rainy season. Therefore there might have been little differences on cultivation technologies between MD and BMNP even the conditions differs. In case of BMNP, the advisors or instructors who has experiences and knowledge on cultivation would be needed for other farmers to improve the quality and quantity of the products. In this field training, the advantages of organization were found. The organization makes plan on the production every year so that members have tasks to provide products, it means that they must maintain the motivation on cultivation and also, they can receive the technical supports and good information on cultivation from the advisor. Therefore, issues can smoothly be deal with when the members have problems on cultivation. So far, in case of the farmers in BNMP who try to organic farming on small scale, it might be needed for farmers in BNMP to facilitate the making some groups as one of solutions(Bautista, 2001).

Even in case of MD, the damages of pest and disease were the serious issues on the cultivation of horticultural crops in rainy season. Therefore, the techniques and experiences on cultivation were more required on organic farming in BMNP. The appropriate spray of pesticide should be needed if farmers in BNMP required to continue providing products in rainy season.

(3) Achievements and future vision

On this field training, it was out of my intent to find the methodology and technologies on cultivation of horticultural crops in rainy season. However, there must have been many chances to detect something in everywhere if there is the purpose. It is no relation to countries, conditions and anything else. It would be depending on each purpose. Making rice 'husk charcoal' and 'Bokashi-Tan' were the one of the good examples for my concept.

In my opinion, it is necessary to make training the local people who have the capability to become a leader if it were considered ’sustainability’. So, the field oriented leader should find key persons who have the capability to become a leader and make the plan in communication with them and then, support them practically and financially. But, as of now, the local people don't often have the opportunities to learn something even if they have clear objective.

Therefore, I suppose that infrastructure, especially construction of internet in developing countries were immediately needed in a realistic manner for the near future. So, people easily get and share the

information about what they want to know and can receive advice without moving by keeping the line with someone who has knowledge and techniques.

(4) Acknowledgement

I could come back to Japan without any accidents by so many helpful supports. First of all, I really appreciate to Dr.Thu and Dr. Hien for their kind coordination in Can Tho and participation to my schedule. I am grateful for Ms. Shii for the arrangements in Hue., Dr. Oikawa and FOLENS staff for preparation before and after this field training and after care also. Finally, Let me thank Dr. Oikawa again and Prof. Ogiwara for watching out for my behaviors during this field training.

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(Supervised by Isao Ogiwara)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Examining rural development through multipurpose uses of coconut in West Kalimantan, Indonesia

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Destination and period: West Kalimantan, Indonesia, Nov. 26- Dec. 10, 2012.

Key words: VCO, Coconut, Palm oil, Community development,

Abstract

I went to Sungai Bemban village, West Kalimantan, Indonesia for 15 days. The purpose of this overseas field training was to research the potential of the community development through making Virgin Coconut Oil (VCO) and charcoal from coconut shell. There are a lot of palm oil plantation surrounding the Sungai Bemban Village and cause of this this village faces to crisis of the disappearance. I try to make living from VCO and coconut shell charcoal to be able to independent economically to solve this situation. With Perkumpulan KABAN and Yayasan Diam Tama those are my counterpart organizations, I went there and do face to face interview to know the possibility of this project.

From the result of my survey, there are potential of making VCO, but we need to organize the villagers. Because coconut lives in the village but each villages have small coconut farm, and to make VCO they need cooperate together.

Through this overseas field training, I learned the how important to see the filed by my eyes. It is easy to focus on just bad side of the problem. However the issue is not so simple. We need to see both side of the problem. Also I'm aware that language is very important to communicate with the people in the place and to get the information.

(1) Contents and activities during the overseas field training.

My purpose of this overseas field training is to research the possibility of rural development through multipurpose uses of coconut; especially by making VCO (virgin coconut oil) and charcoal in West Kalimantan, Indonesia.

Why I chose West Kalimantan, Indonesia? There are some issues in the area; deforestation, insect affection of the coconut farm and also the village in that place faces to crisis of extinction. These issues cause of increasing of the palm oil plantation.

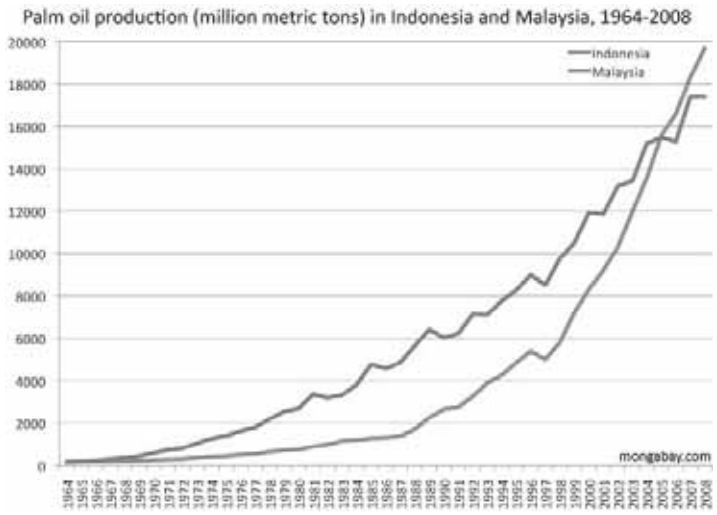
Why are the palm oil plantation increasing and why this problem is happened? The demands of palm oil are rising rapidly in the world, and global palm oil production is increasing by 9% every year. (European Commission, 2006) Indonesia has been the world's biggest palm oil producer since 2005(Fig. 1).In the 1980s, Indonesian government handed out vast areas of land to both foreign investors and domestic business group for oil palm plantation. Thus the plantation area reached 6.65 million ha in 2007 or more than ten times greater than that in 1985. (Sri 2008) Especially, in West Kalimantan, the plantations are increasing by reason of having vast land and low population density. In 2012, it will be the largest oil palm plantation area by province. (Sri 2008) This is the background of these issues and so, not to relay on only the palm plantation, I want to make a living by using coconut (Cocos nucifera), especially making virgin coconut oil (VCO) and charcoal. Why did I choose Coconut? Coconut lives and is familiar in Indonesia, and also has many ways to use like oil, charcoal, soap, scrubbing brush etc. Why did I choose especially VCO and charcoal? VCO is high value products and charcoal is easy to make. Also some villagers make charcoal from coconut already so that it's easy to be spread in the place.

In order to get a living without leaning on only palm oil, my study through the training reveals the possibility of rural development through uses of coconut.

My counterpart organizations are Perkumpulan KABAN and Yayasan Diam Tama. Both are Indonesian NGO and they focused on the environmental problem in west Kalimantan. Yayasan Diam Tama makes charcoal from coconut and they teach how to make charcoal to villagers. Perkumpulan KABAN is focused on the solving the situation of the Sungai Bemban village and they know the area so well. That is why I chose these two NGO to my counterpart.

Training content & Training schedule is below;

1. To know about my counterpart, I went to kulon progo village to research its activitys.2 I visited two charcoal factories in Jogjakarta to study the situation of the charcoal of coconut shell.3 I visited Sungai Bemban village and did field survey to understand the potential of the VCO project or to get the information of coconut, especially impact of villager's economy (comparing to palm oil). This is the main part of this training and so I stayed in this village almost 1week.4 I attend the work shop about charcoal of coconut shell. 5 I also attend the seminar that was hold from Dian Tama Foundation to know about my counterpart.6 Try to make VCO in the village (Pic 1&2).



(Fig 1)Palm oil production from 1964-2008 according to the U.S. Department of Agriculture

(Pic.1) Making VCO in Sungai Bemban village

(Pic. 2)Making VCO in Sungai Bemban village

(2) Findings and achievements obtained, significant experiences and lessons

Findings;

In this village, there are 257 families live. And 4people make the charcoal from the coconut. Nobody makes VCO. Many people told me that the price of coconut is very cheap and so are interesting about making VCO. However there is little information about VCO. That is why now I try to do the demonstration how to make the VCO in there. From the result of face to face interview, there are enough coconut trees to make the VCO in the village. However each people have small coconut farm and it means that there are potential of making VCO if they cooperate to make VCO together. (Table 1)

So first, to start this project we need to organize the villagers. Also between the palm oil plantation (Palm Oil Company) and villagers, there is good relationship. Couse of the plantation, young people or woman can get the job. Also the Company built infrastructure. So I can say that making the VCO can be one of the selections of the job.

(Table 1) Number of coconut trees in some villagers

Name	Area (ha)	Number of trees	Number of trees (bearing)	Number of coconut	Number of coconut/ha
Rhusdi	0.34	60	40	600	1,765
Arianto(Jupri)	2.85	320	300	2000	702
Ate	0.3	70	70	2000	6,667
arup/Yan	1.52	300	300	4500	2,961
Bakar	1.17	160	100	1500	1,282
Ishak	1.1	60	30	300	273
Munadi	1.79	350	350	8000	4,469
Deramid	0.5	60	50	1000	2,000
Hamid	0.75	160	100	2000	2,667
Dang R	1	66	66	1300	1,300
Mustafa	1.52	320	320	12000	7,895
Usman	0.64	160			
Sumi	0.93	160			
	14.41	2246	1726	35200	

Lessons;

I get good lessons from this training. Before I went to Indonesia, I read a lot of thesis about impact on the environment from palm oil plantation. I guessed the situation of the area, and I thought there were many environmental problems like deforestation, biodiversity, water contamination and so on. However, my guesses were let on down. I cannot say the plantation (or Plantation Company) is totally bad. They give villagers some jobs and money. They build some roads so that village can use. Surprisingly, there is good relationship between the Palm Oil Company and villagers. Of course there are some issues in the area, but I never focused on the good point of the company or palm oil plantation before this training.

From this experience, I never ever forget to see the both side (good point and bad point) of the problems. I experienced to go the field is very important to understand the both side of the situation. And I want to do my master's thesis using this lesson as a field-oriented leader in environmental sectors in Asia and Africa. Also I try to not to be biased against issue when I do my research.

Suggestion to this overseas field training;

This overseas training is very good chance to experience how to research as the field-oriented reader.

From my experience, I suggest that we need to study languages before the overseas field training so that we can communicate people in the area. To communicate is very important to understand the people, area and the issue, I think. So if there are some chances to learn the languages before the training, I think, the training become much more manful.

(3) Achievements and its future vision (less than 400 words)

I want to continue my survey and do the VCO project in Sungai Bemban village. Then I never ever forget to see the both side of the problems that I learn from this training as field-oriented leader. Also my research contributes to other places that are some situation as my research place. So my action contributes to environmental problem not only in Indonesia but also in other places in the world.

(4) Acknowledgement

My deepest appreciation goes to Perkumpulan KABAN and Yayasan Diam Tama whose enormous support and insightful comments were invaluable during the course of my study. I would also like to thank Mr. Hirowaka who gave me invaluable comments and warm encouragements. And also I am deeply grateful to stuff of FOLENS who help me a lot and give me the chance of this wonderful experience.

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(Supervised by Professor, Masaaki Yamada)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Research on allelopathic activities of local plant species in South and South-west China

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Tokyo University of Agriculture and Technology
Host Organization: South China University of Agriculture
Location: Guangzhou, Guangdong province, China
Duration: 2013.2.17-2013.3.24

Key words: Screening, Allelopathic activities, Ecology, Environment, South and south-west China

Abstract

South and south-west China is the most important region for plant diversity in China. Number of species in Guangdong province is 6851, Guangxi province is 8799, Yunnan province is 18930, and Sichuan province is 12762. In this overseas training，I collected about 160 species of local plants in Southern and southwest China area, screened their allelopathic activities in South China University of Agriculture．More than 40 allelopathic species were found and they are expected for future research use． By visiting local university and research center, we discussed about some Ecology and environment problem.

(1) Contents and activities during the overseas field training (less than 600 words)

Title	Research on allelopathic activities of local plant species in South and South-west China	
counterpart	Dr. Renseng Zeng, a professor in South China University of Agriculture	
Supervisor	Dr. Yoshiharu Fujii, a professor in Tokyo University of Agriculture and Technology	
Training schedule	Date	Content
	2013.2.17-2013.2.19	Visit Wuhan botanical garden, collected 51 species of plant samples

	2013.2.20	Talk about allelopathy of Chinese medicine plants with the experts of Yunnan University of Traditional Chinese Medicine
	2013.2.20	Visit Yunnan University of Agriculture，talk about Ecology problem，especially Invasive plants problem and weed control with location researcher
	2013.2.21	Visit Kunming botanical garden，collected 38 species of plant samples
	2013.2.25	Visit South China botanical garden，collected 76 species plant samples
	2013.2.22-2013.3.24	Visit South China Agricultural University , experiments in Key Laboratory of Tropical Agro-environment

Collected plant samples in a botanical garden

Visit Yunnan University of Agriculture, discussion with researchers

Meeting with location medical professor, and talk about how to use the medical plants in Agricultural area

Visit South China University of Agriculture, talk with local research leaders

A laboratory in Key Laboratory of Tropical Agro-environment

Allelopathy is a phenomenon whereby secondary metabolites synthesized by fungi, viruses, microorganisms and plants influence biological and agricultural systems, which may be either stimulatory or inhibitory (Torres *et al*., 1996).

(2) Findings and achievements obtained, significant experiences (less than 600 words)

Method

A. Sample collection: In 2012 July and in 2013 from February to March, 160 plants species were collected in Wuhan botanical garden, Kunming botanical garden, Guangzhou botanical garden and South China University of Agriculture. The main part collected was plant leaves. The samples were oven-dried at 60 ^{o}C for 24 hours. After an appropriate drying, the leaves were kept in a plastic bag and then in an air-tight box until further use.

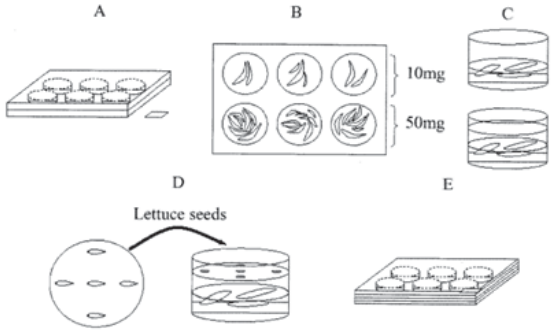
Screening

Screening method：The exudation of allelochemical have 4 routes, From this 4 routes , In our past experiment, we have four methods to screening allelopathic activity, in this time, I only use Sandwich

Method.

Sandwich Method

The Sandwich Method was developed byYoshiharu Fujii in Japan (Fujii 1994) as a bioassay method to determine the allelopathic activity of the leachates from donor plant leaves and it has been used for the screening of a large amount of medicinal plants, both herbal and arbor species (Fujii et al., 2003; 2004; Morita et al., 2005).



Initial results

Through the screening about 165 kinds of plants by from Sandwich Method, some species were found find out to have potential some of it have allelopathic activities. potential，the table 1 shows the 45 special plants that have most strongest allelopathic activities.

Table 1

Sample		Extension（%）				Sample		Extension（%）			
		A		B				A		B	
No.	Name	R-10mg	H-10mg	R-50mg	H-50mg	No.	Name	R-10mg	H-10mg	R-50mg	H-50mg
-	*Control*	100	100	100	100	23	*Elaeocarpus apiculatus*	95	117	23	44
1	*Photinia glabra*	0	0	0	0	24	*Dimocarpus longgana*	53	108	24	96
2	*Hibiscus syriacus*	15	75	6	33	25	*Magnolia sirindhorniae*	70	108	24	45
3	*Duranta erecta*	43	78	8	26	26	*Cottonrose Hibiscus*	62	146	24	76
4	*Lycoris radiata*	26	92	9	35	27	*Acanthopanax sessiliflorus*	46	116	24	75
5	*Dracontomelon duperreanum*	13	40	13	45	28	*Alpinia oxyphylla*	54	109	25	71
6	*Piper sarmentosum*	40	95	15	66	29	*Daphne papyracea*	41	111	25	66
7	*Cassia siamea*	41	67	15	64	30	*Anisodus acutangulus*	45	116	26	106
8	*Kadsura coccinea*	45	90	16	48	31	*火果*	35	65	26	57
9	*Hibiscus syriacus*	42	136	16	60	32	*Corydalis taliensis*	56	70	26	38
10	*Excoecaria acerifolia*	45	91	17	45	33	*Hopea chinensis*	59	57	26	55
11	*Cordia dichotoma*	31	76	18	73	34	*Dillenia turbinata*	60	113	27	70
12	*Madhucapasquieri(Dubard)Lam*	42	75	19	81	35	*Ceiba speciosa*	68	109	27	91
13	*Pothos chinensis*	48	107	19	51	36	*Mahonia lomariifolia*	35	67	27	54
14	*Acorus gramineus*	59	126	20	68	37	*Osmanthus matsumuranus Hayata*	52	104	28	90
15	*Bridelia tomentosa*	86	179	21	82	38	*Ficus lacor*	86	123	28	86
16	*Amomum tsaoko*	68	149	22	90	39	*Artabotrys hexapetalus*	58	84	28	69
17	*Schefflera octophylla*	66	130	22	60	40	*Acronychia pedunculata*	39	84	29	76
18	*Averrhoa carambola*	67	115	23	73	41	*Hedera nepalensis*	60	106	29	105
19	*Gendarussa vulgarisNees*	62	145	23	80	42	*Alstonia scholaris*	52	92	30	88
20	*Vitexquinata(Lour.)Williams*	60	88	23	65	43	*Mahonia fortunei*	55	77	30	81
21	*Ficus drupacea*	49	96	23	88	44	*Alstonia scholaris*	52	92	30	88
22	*Iris japonica*	52	89	23	64	45	*Machilus oculodracontis chun*	69	107	30	69

(3) Achievements and its future vision (less than 400 words)

In this research, through the screening large number of local plants in Southern and southwest China, I find found out allelopathic active plants. Effective ingredients of the plants are expected to be, extracted, and isolated, and identified, for further application to agricultural production. In the next experiment, some plants which have strong allelopathic activities will be selected, and more samples to be collected to isolate and identify the allelochemical from the plants.

Through this overseas training, I studied a lot, and through the experiment also got some experimental data. I think this these also can plays a very useful role in my future experiments. Through the screening a large number of native plants, some of them showed promise. Therefore effective and useful substance can be find out the plants have allelopathic activities, extraction, and isolation, identification, for further application to agricultural production if we are successful to extract efficiently. Through analysis the allelochemicals, determine it herbicidal activate, and through animal test to proof it have no significant toxicity for human and animal. After this experiment, in my idea, I have two methods to application allelopathy. First method, direct use allelopathic plants as cover crop, direct use allelopathy plants to reduce weeds. Second method, extract allelochemicals from plants or synthetic allelochemicals. After determine the structure of allelochemicals, through organic synthesis to manufacture allelochemicals, or through the plant tissue culture technology to culturing a large number of the plant cells, extract allelochemicals from plant cells. Use the allelochemicals which extract from plants or synthetic in factory as new herbicide. Future, promote this two application methods in China, will be improve the worsening China Agricultural Environment.

Acknowledgement

I would like to thanks the local teachers and researchers who gave me a study and research platform，especially thanks to the professors and students of China Ministry of Agriculture Key Laboratory of Tropical Agro-environment, South China Agricultural University，they helped me collected samples, provide me space, and reserve good accommodation to me.

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(Supervised by Yoshiharu Fujii)

Report of Overseas Field Training
FOLENS Program
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Study about the quantity of Ammonia-Oxidizing-Bacteria in the Sewage plant in Thailand

Bao Qian
M1, Dept. of Applied Chemistry, School of Engineering
Oversea field training in Thailand from July 28-August 10, 2013

Key words: AOB, wastewater treatment plant, quantity, water environment

Abstract

It was our great oppotunity to have an overseas field training in Thailand in 2 weeks in 2013, which we had learnt knowledge about wastewater treatment and management in Phuket. At many study sites in Phuket city and Bangkok, we learned about the technology and processes of biological wastewater treatment. We learned about the technology and processes of several sewage treatment plants by biological treatment based on activated sludge and attached growth treatment .It was very important opportunity for me, a student of environmental engineering, to experience in the real sewage treatment plants,and also study about the quantity of Ammonia-Oxidizing-Bacteria in activated sludge in sewage treatment plant. The results showed that Treating efficiency of this WWTP was high, the effluent quality as below the limit value by Thailand's standard. And we learned about solid waste collection and treatment by incineration in Phuket, In addition, the landfill management in Ayuthaya have been visited. According this trip at landfill, we know that landfill is still very popular in Thailand which caused pollution to surrounding environment and negative impact to eople health. We was introduced about how the impact of landfill to nearby community and water and soil environment.

(1) Contents and activities during the overseas field training (less than 600 words)

My overseas field training was focused on the quantity of Ammonia-Oxidizing-Bacteria(AOB) on water environment in sewage treatment plant of Thailand, which was carried out in Thailand from 28/07/2013 to 10/08/2013 under supervision of Assoc. Prof. Yoneda Kenichi, Assis. Prof. Ozaki Hirokazu, FOLENS, TUAT and some supports by College of Environment and Natural Resources, Kasetsart university, Thailand. Followings are the main study topics of my training:

Topic 1: To quantify the Ammonia-Oxidizing-Bacteria (AOB) in AO system in Phuket

Background 1:

AOB is the bacteria community responsible for nitrification, which plays a key role in the biological removal of nitrogen in wastewater treatment systems and The growth rate of AOB is much slower than denitrifying bacteria ,so AOB significantly effect to treating time and efficiency. WWTP in Thailand is AO system . AO (Anoxic – Oxic) type. And it is the most popular type of sewage treatment plants in the world. Even though AOB is generally appear in nitrification stage with high density ,however in my study I took samples at both oxic and anoxic stage For measuring AOB community.

Background 2 :

Anti-biotic compounds have probably been present in water and the environment for as long as humans have been using them.

The drugs(anti-biotic) that we take are not entirely absorbed by our bodies, and are excreted and passed into wastewater and surface water. It will impact to human health and lead to appearance of drug-resistance-bacteria. Up to these backgrounds, I would like to quantify the Ammonia-Oxidizing-Bacteria (AOB) in AO system in Thailand in order to: understand the condition of nitrification process and its importance in wastewater treatment in tropical area. in addition, obtain data of AOB quantity in WWT for further application in anti-biotic degradation by pure and mixed culture.

Experimental result:

There is the data of influent WW and effluent WW in Phuket WWTP(Figure 1). several parameter including BOD ,SS,TKN,and TP.

	Phuket WWTP			WWTP in Tokyo	
Parameter (mg/L)	Influent	Effluent	Standard	Influent	Effluent
Biological oxygen demand (BOD)	165	2.9	< 20	169	2
Suspended solid (SS)	532	8.4	<50	-	-
Total nitrogen (TKN)	21.2	3.4	<20	30	10
Total phosphorus (TP)	11.6	1.3	<2	3.5	0.8

Figure 1 The influent WW and effluent WW in Phuket WWTP

There is the data of real time PCR to quantity the AOB in WWTP(Figure 2). Average gene copy numbers of *amoA* genes in aerobic and oxic tanks of Phuket WWTP is showen. And from this figure we can know that AOB in oxic stage is more abundance than in anoxic stage.

AmoA gene (copy/ng-DNA)	AO-Phuket	AO – Japan (Miyagi)
Anoxic	115.3	680
Oxic	225.2	105

Figure 2 AOB quantity in Phuket WWTP

Topic 2: Learn about the technology and processes of biological wastewater treatment in Bangkok

Topic3 : Learn about solid waste collection and treatment by incineration in Phuket

From visiting the solid waste Incineration, we realize that it could be proper treatment for solid waste if the air pollution issue is well managed.

Topic 4: Study about landfill management in Ayuthaya

According to visit the Ayutahya landfill, we could realize that landfill polluted surrounding water environment and people health, so the better solid waste management (including incineration) should be applied.

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

Knowledge and data gained from this overseas field training are especially important to my master research on wastewater treatment system and my future career. I am a student from Inner Mongolia of China, therefore environmental issues in my hometown seems very familiar for me. However, this overseas field training has provided me a great opportunity to understand more about environmental issues in my region much more than before. We have visited many study sites that I have not experienced before such as wastewater treatment systems of wastewater treatment plant, landfill,here I could talk to many people and learn about environmental issues in Thailand from different viewpoints, particularly the wastewater treatment technology and waste management, water pollution .

(3) Achievements and its future vision (less than 400 words)

My long-term goal is to be a good researcher in the field of environmental science and management, which at that position I can exchange my knowledge and skills. With the knowledge gained from completing FOLENS overseas training with particular focus on wastewater situation and management, I could have understood more about water environmental issues and other aspects including impacts of people on natural resources and environment in different places in Thailand. This overseas field training also offer me opportunity to learn about environmental issues from other regions tudents and professors, which will be very useful for my future career related to water and waste water management. All in all, I hope I would be able to share my knowledge gained throughout my master studies and FOLENS program and other students in Thailand including visiting regional and international scholars.

(4) Acknowledgement

I am grateful to my supervisor, Assoc. Prof. Terada akihiko, and Assoc.Prof. Yoneda kenichi for their valuable advices, discussions as well as assists for my works during overseas field training and data analysis. Special thanks to Kasetsert university, Prof. Lekk, and his students for their arranging the samplings and sample analysis. Many thanks to my classmates in the oversea field training for valuable discussions during the field trip. This oversea field training is assisted and financially supported by the Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa (FOLENS), of Tokyo University of Agriculture and Technology, Japan.

(5) References

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Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Study nitrous oxide (N_2O) emission from sewage treatment plant in Thailand

SONG, kang
D2, Dept. of Applied Chemistry, School of Engineering
Oversea field training in Thailand from July 28th – Aug 11th, 2013

Key words: sewage treatment plant, nitrous oxide (N_2O), Thailand

1. Background and Abstract

It was a great opportunity to have an overseas field training in Thailand in 2 weeks in August 2013. This training was supported by Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa (FOLENS) at Tokyo University of Agriculture and Technology (TUAT). My objective in this training is to quantification of nitrous oxide (N_2O) from Thailand wastewater treatment plants (WWTPs). N_2O is one of three important greenhouse gases, i.e. carbon dioxide (CO_2), methane (CH_4) and N_2O (Susan 2007). Tropospheric N_2O levels have sharply increased by 16 percent from preindustrial values of about 270 ppb to 319 ppb in 2005, at an average incremental rate of 0.2%-0.3% per year. Values presented from the Intergovernmental Panel on Climate Change (IPCC) show that total N_2O emissions amount to 17.7 Tg N per year, thereby contributing 7.9% to the global anthropogenic GHG emissions expressed in CO_2 equivalents in 2004 (Susan 2007). Even though the proportion of the amount of N_2O compared with the other two important GHGs around the global is lower, but greenhouse effect of N_2O is much higher than CO_2 and CH_4, concretely about 300 and 12 times higher greenhouse effect than CO_2 and CH_4 in 100 years, respectively (Griggs and Noguer 2002). Moreover, N_2O has a longer lifetime than other GHGs, i.e. about 114 years. On the other hand, N_2O can participate in ozone depleting, and recently it has been reported that N_2O is the dominant ozone-depleting substance emitted in the 21st century (Ravishankara, Daniel et al. 2009).

Global N_2O emissions from municipal wastewater treatment plants (WWTPs) were reportedly 0.22 Tg-N/year in 1990, which was equivalent to 3.2% of the total anthropogenic N_2O emissions (Houghton, Ding et al. 2001). Global N_2O emissions from wastewater treatment are expected to increase by approximately 13 percent between 2005 and 2020 (Law, Ye et al. 2012). On the other hand, the quantification of N_2O emissions from WWTPs shows a huge variation until now (Kampschreur, Temmink et al. 2009). Accordingly, it is very necessary to quantify N_2O clearly and mitigate N_2O emissions from WWTPs.

In this training, I visited four WWTPs in three cities of Thailand and investigated the quantification of N_2O emission in Phuket WWTP. N_2O emission data and related analysis are shown in the next part. This overseas training broadened my horizons to face greenhouse gas on other county. I have learned a lot not only about N_2O from WWTPs but also from landfill, paddy field and so on. I obtained not only knowledge but also useful experiences such as communication skills. From these experiences, I think good cooperation in the world is important to confront complex environmental problems.

2. Visiting site, objective and method

From 28th, July to11th, August, 2013, I participated in total two week's overseas field training in Thailand. It was a good opportunity to conduct field surveys in Thailand and broaden my vision on local environmental problems. Through this extremely important essential training, undoubtedly I could enhance my abilities and skills as a future environmental leader in Asian and African regions. Thailand is one of the major developing countries. The population has increased by 2.3 million in recent 10 years, with significant economic growth from 142 billions to 366 billions (Figure 1). Such immense population and economic growth has left various environmental problems, e.g. emission of waste and wastewaters, behind.

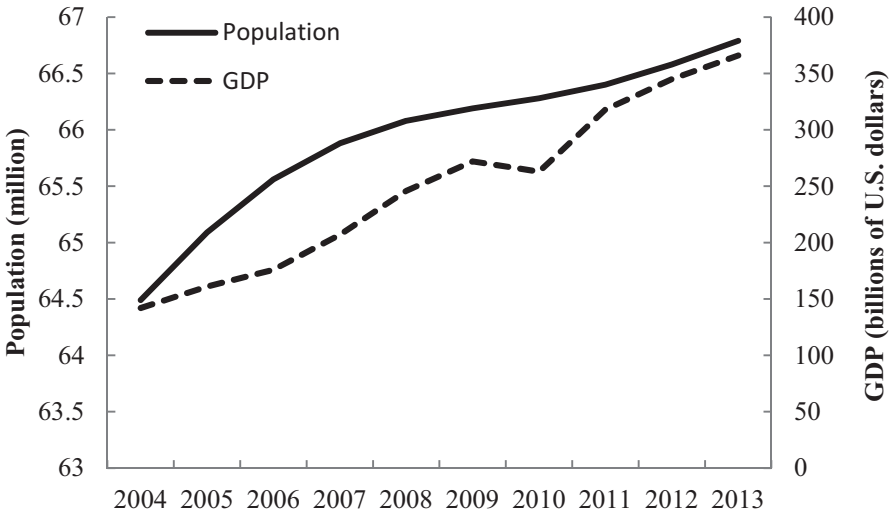

Fig.1 Change in population and GDP in Thailand (data from www.tradingeconomics.com)

During this training period, I and other participants visited three areas of Thailand (Phuket, Bangkok and Phitsanulok) as shown in Figure 2. We visited lots of plants and companies, and people, such as sewage treatment plants, landfills, paddy fields, bio-ethanol plants, university, and governmental organization. In this visiting process, we tried to do our best to focus on environmental issues and problems, to ask some questions on greenhouse gas (GHG) emission and waste management, and to communicate with professors, managers and engineers.

In this overseas training, one of the important themes is GHG emission from wastewater treatment plants (WWTPs). Our objective is investigation of quantity of GHG emission and microbial community structure in Thailand's WWTPs. We visited four different WWTPs in Thailand, each plant of location and

theme is shown in Table1. In the next section, an introduction of N_2O emission from WWTPs is summarized

.

Fig. 2 Training areas in Thailand

Table. 1 Visiting place and theme

	Place	Name	Theme
1	Phuket	WWTP of Phuket Municipality	Visit and take samples
2	Suphanburi	WWTP of Suphanburi Municipality	Visit and lecture
3	Bangkok	Dindaeng WWTP	Visit and lecture
4	Phitsanulok	WWTP of Phitsanulok Municipality	Visit and lecture

Among these visited WWTPs, we took samples and investigated the amount of N_2O emission in WWTP of Phuket Municipality (Figure. 3).

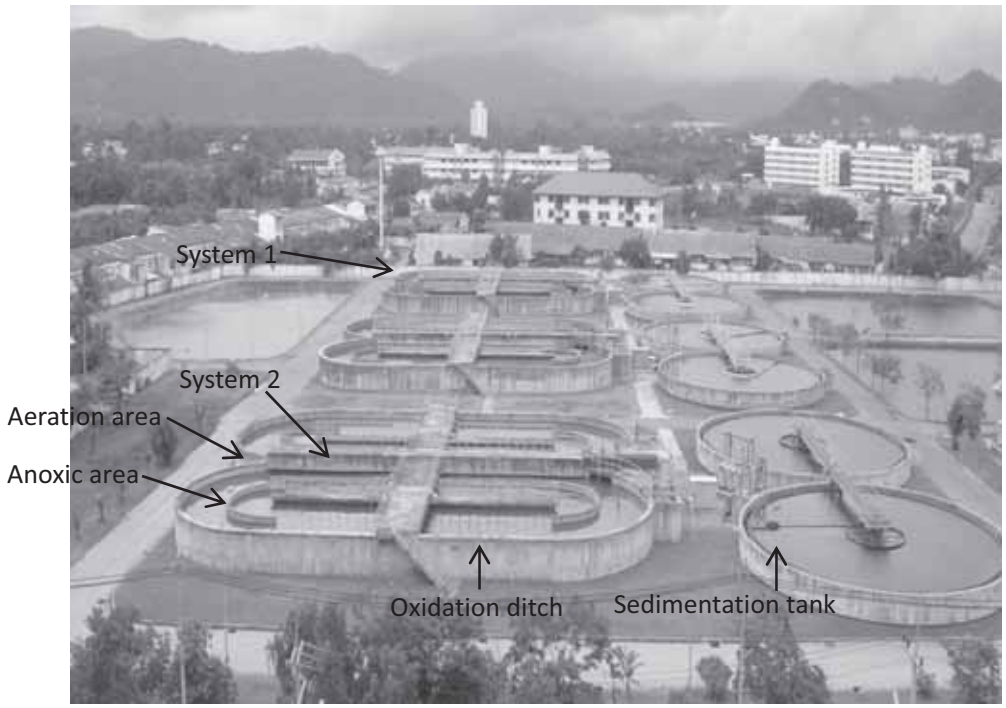

Fig. 3 Areal image of the WWTP in Phuket

The WWTP in Phuket employs by three oxidation ditch systems as a main biological process, followed by the corresponding sedimentation tanks in parallel, as shown in Figure 3. Some of the parameters of this WWTP listed in Table.2. Two from the three oxidation ditch systems were subjected to the investigation. In System 1, the intensity of aeration is low with very high ammonia concentration (15.6 mg/L); And in System 2, normal operation with low ammonia concentration (1.4 mg/L). Each oxidation ditch has a buffle to get wastewater recirculated and embeds a diffuser on the bottom to supply air in the tank. This aeration creates an aerobic zone and an anaerobic zone close to and far away the diffuser, respectively, allowing for redox zonation in a single tank.

Inflow wastewater is divided into two lines: 50% of flow into the aeration area and the rest of the anaerobic area (as shown in the follow Figure.4)

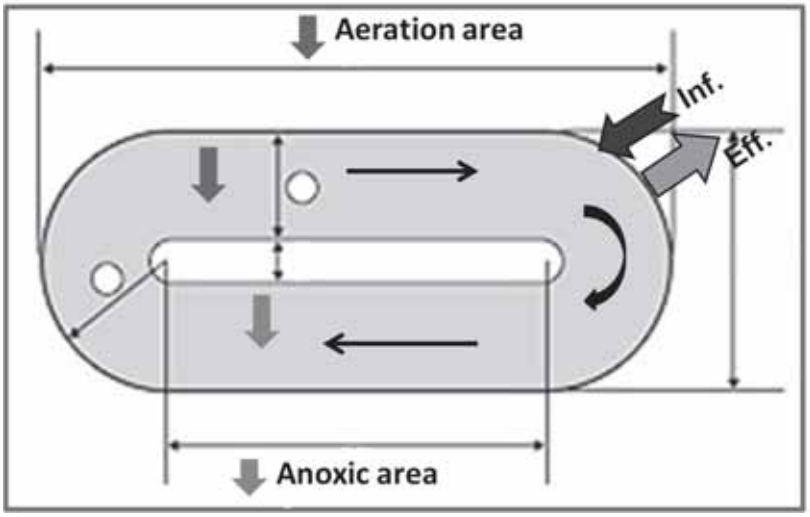

Fig. 4 One system of investigated WWTPs

Table 2. Some parameters of Phuket WWTP

Parameter	Influent	Effluent	Thailand Standard
Influent volume [m^3/d]	27,495	27,495	
pH	7.15	7.06	5.5-9.0
BOD [mg/L]	165.6	2.9	≤20
SS [mg/L]	532.1	8.4	≤50
G&O [mg/L]	42.0	2.3	≤5
TKN [mg/L]	21.2	3.4	≤20
TP [mg/L]	11.6	1.3	≤2
COD [mg/L]	1040.0	108.0	-
HRT [d]	1-1.5		-
SRT [d]	10		-
Average temperature [°C]	29.0-32.0		-
Average DO [mg/L]	0.07-1.2		-

A chamber used for collection of N_2O in this plant was devised by Professor Pongsak Noophan's laboratory at Kasetsart University, Bangkok. It is cylindrical with a diameter and height of 30 cm each, (20 cm on the surface of water). The chamber used in this investigation is shown in Figure 5.

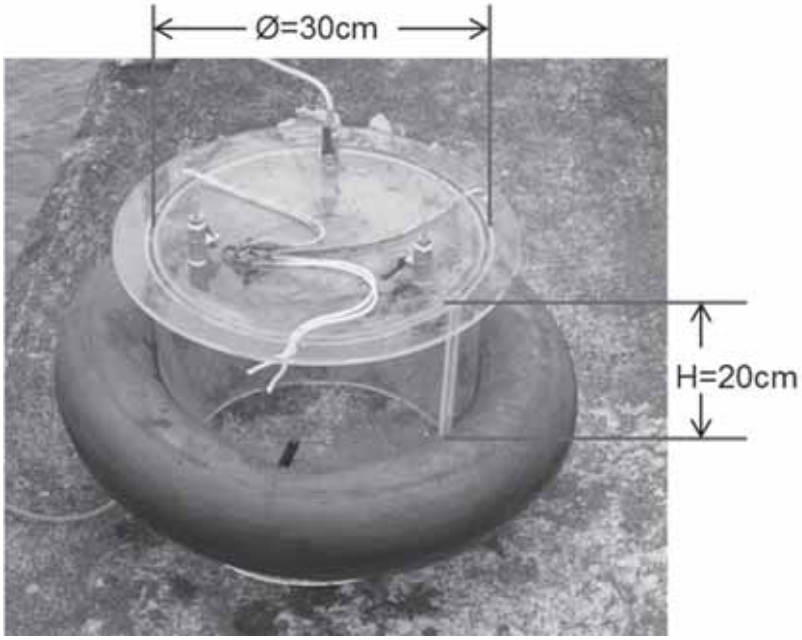

Fig. 5 The image of the sampling chamber for this investigation

We used this chamber in the aerobic (Left in Figure. 6) and anoxic areas (Right in Figure. 6), respectively of two oxidation ditch systems.

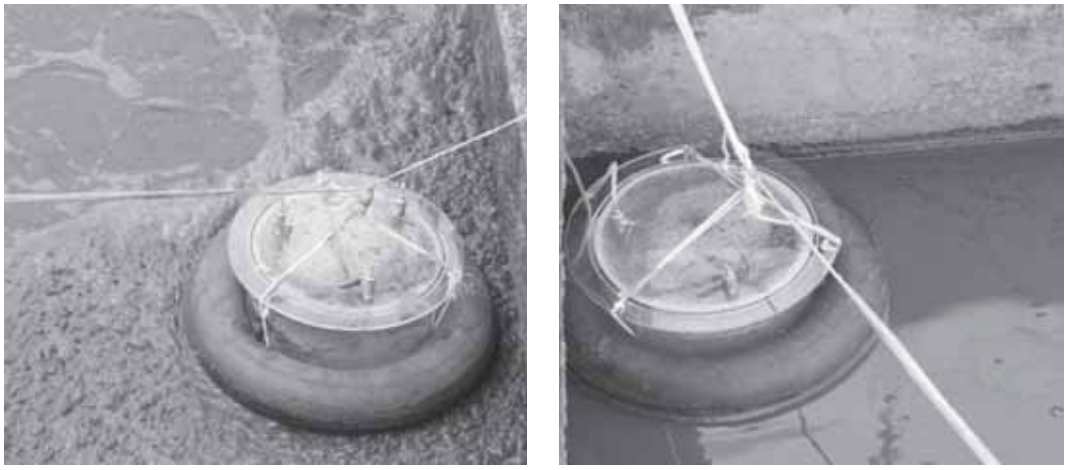

Fig. 6 Sampling locations for this investigation: Left panel: the aerobic zone; Right panel: the anaerobic zone in the oxidation ditch

A gas sample of each chamber was taken at the beginning of the experiment and after 24 hours. A vacuum pump connected the tube and gas pocket were used to take gas from the chamber. Then, the gas was transferred from the gas pocket to a laboratory gas bag (Figure. 7A), subsequently, from the bag to a gas vial (Figure. 7B) by a syringe. Finally, the collected gas in the vial was brought back to our lab at TUAT to measure N_2O by GC-ECD (Shimadzu, Kyoto, Japan) (Figure. 7C).

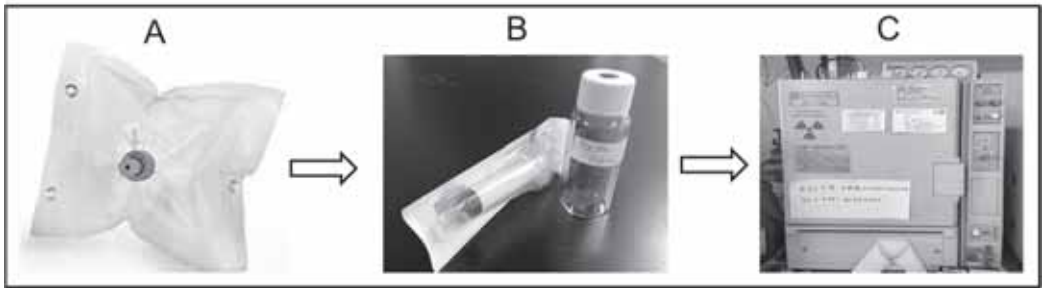

Fig. 7 Procedures of collected gas transfer to the laboratory at TUAT

3. Findings, achievements and lessons

Result of the sample in System 1 is shown in Figure. 8. N_2O emission from the aeration area (344.9 $mg/m^2/h$) was significantly higher than that from the anoxic area (51.2 $mg/m^2/h$). The important reason can be explained as follow: N_2O is usually produced from an anoxic area as dissolved form and then transported to the aeration area where N_2O is finally emitted to the atmosphere as an exhaust gas (Kampschreur, van der Star et al. 2008).

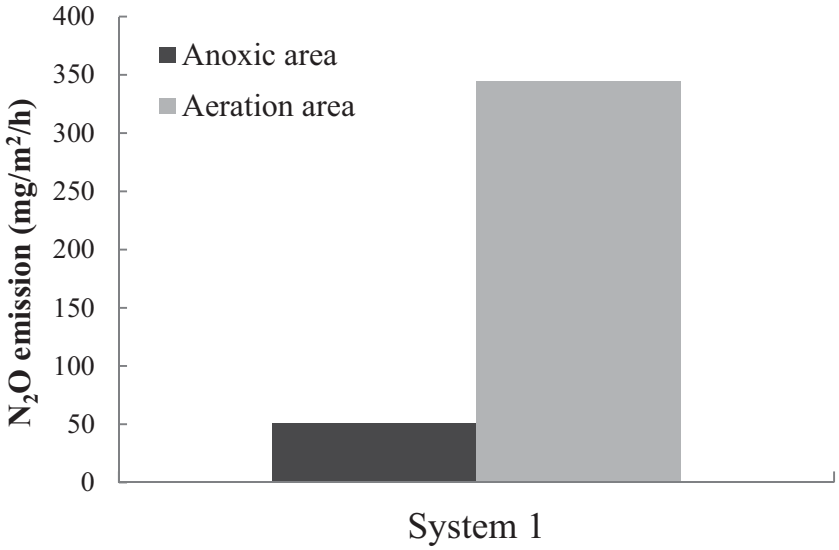

Fig. 8 N_2O emission from the different area in System 1

N_2O flux under anoxic conditions from System 1 and System 2 shown in Figure 9, N_2O flux from System 1 (51.2 mg/m^2/h) was higher than that in System 2 (9.2 mg/m^2/h). Because of ammonia concentration in System 1 (15.6 mg/L) was higher than that in System 2 (1.4 mg/L). Ammonia concentration is one of importance factors to influence N_2O emission (Kampschreur, Temmink et al. 2009).

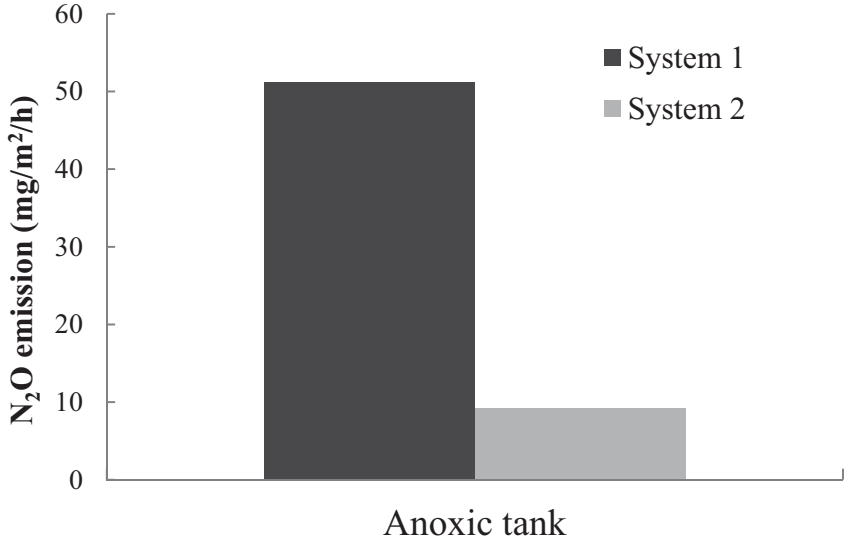

Fig. 9 N_2O emission in the anoxic area between different systems

We also visited other WWTPs there and had lectures by their managers and operators. They gave us useful and practical information and knowledge about the WWTPs and wastewater treatment situation in Thailand. We communicated with them about environmental problems in the process of wastewater treatment and, moreover, got to know their awareness of GHG emissions from WWTPs. Through this communication, we learned a lot each other. I studied not only about the knowledge on N_2O emissions from WWTPs, but also the way to take samples instructed by Professor Pongsak Noophan, an assistant professor at Kasetsart University Bangkhen in Thailand, to communicate with and get from local stakeholders, and so

on. I think this was a meaningful training for me, and also I realize the significance to prepare material and questions well before starting field training in future. Such preparation will give me more powerful enthusiasm to focus on N_2O mitigation from WWTPs which is also my doctor topic.

4. Conclusion and Acknowledgement

Besides these sewage treatment plants, during this oversea field training, we visited landfill, incinerator, bio-diesel plant, bio-ethanol plant, paddy field, waste manage company, university, government related department and so on. We also had some lectures which enlarged my eyes about environment problems. The survey of these places gave me intuitive feelings about diverse environment problems, e.g., along with economic development.

In future, I will pay more attention to environmental protection in our daily life. Likewise, I will work hard for my research topic (mitigation of N_2O emissions from WWTPs) in my Ph.D. study. The FOLENS field training gave me a good opportunity to communicate with people in several foreign countries; we made good friends and left good memories. We should face our environmental problem with global vision, especially GHG emission. I think good cooperation in the world is important to confront complex environmental problems.

To conclude, I acknowledge the FOLENS program for financial support and enthusiasms to organize this field training.

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Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Quantification of *nosZ* gene of activated sludge derived from sewage treatment plant in Thailand

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Destination and period: Thailand, 28th July-10th August

Key words: global warming, nitrous oxide, wastewater treatment, *nos*Z, qPCR

Abstract

Global warming has been a huge environmental problem and human activity has been increasing the atmospheric concentration of greenhouse gas. Nitrous oxide (N_2O), one of the greenhouse effect gas as well as ozone-depleting substance, has been getting attention because of its high global warming potential. N_2O from the wastewater treatment accounts for about 3% of N_2O emissions from all sources and ranks as the sixth largest contributor. Therefore, it has been an agenda how to reduce N_2O from wastewater treatment process. From this reason, I decided to focus on N_2O emission from wastewater treatment system, especially from municipal sewage treatment system. There are some differences of the system between Thailand and Japan, so that N_2O emission level can be varied. To compare the difference, activated sludge was taken from both aerobic and anoxic basin from a municipal sewage treatment system in Phuket and was quantified the *nos*Z gene ratio to all bacteria using real-time PCR method. As a result, there are no differences between aerobic and anoxic community. Throughout this field training, I learned that to be a field-oriented leader, it is needed to communicate with local people and to find out what the background behind the problem is by our own eyes. At least, if we try to accomplish something abroad, we need the help of local people and we should appreciate it.

(1) Background of the training topic and activities during the overseas field training

[Background & Objective]

Global warming has been a huge environmental problem. It is said that human activities have been promoting the emission of greenhouse gas, such as carbon dioxide, methane and nitrous oxide. Nitrous oxide (N_2O), one of the greenhouse gas as well as ozone-depleting substance, has been getting much attention because of its high global warming potential with 300 times higher than that of CO_2. Its atmospheric

concentration is now increasing at an alarming rate of 0.31% per year. Human activity, such as agriculture, fossil combustion, manure management and waste management, has been responsible for 40-50% of the annual increase of in N_2O emissions. During the N_2O emission process from agriculture and waste management, biological nitrification and denitrification (Fig. 1) are the main sources.

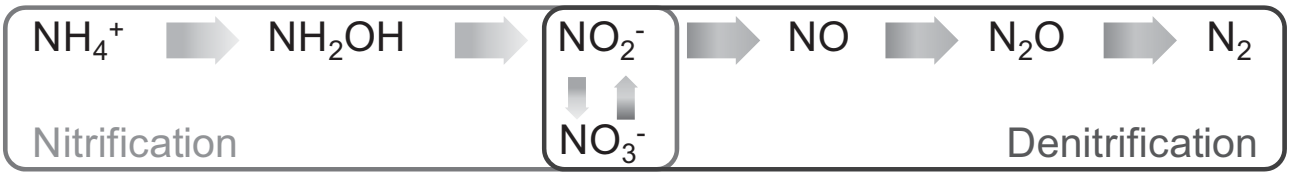

Fig. 1 Reaction pathway of biological nitrification and denitrification

N_2O from the wastewater sector accounts for about 3% of N_2O emissions from all sources and ranks as the sixth largest contributor (US-EPA, 2006). During wastewater treatment, N_2O can be emitted mainly from activated sludge section where biological nitrification and denitrification are taken place for the decomposition of nitrogen nutrition. Some reports said that global N_2O emissions from wastewater treatment are expected to increase by approximately 13% between 2005 and 2020 (Law *et al*., 2012). Therefore, it has been an agenda how to reduce N_2O emission from wastewater treatment process especially among urban water authorities. In this research, from several kinds of wastewater treatment, I focused on the municipal sewage treatment system which purifies household wastewater.

There are several kinds of municipal wastewater treatment plants, and N_2O emission level can vary between plants because of different designs and operational conditions (Law *et al*., 2012). Fig. 2 and Fig. 3 show the two different types of wastewater treatment plants. A modified Ludzack-Ettinger system (Fig. 2) has been popular among developed countries including Japan. In the system, an anoxic zone precedes the aerobic zone (Tchobanoglous *et al.,* 2002). From aerobic zone, part of nitrified wastewater containing NO_3^- is re-circulated back to the anoxic zone. In contrast with modified Ludzack-Ettinger system, oxidation ditch (Fig. 3) is popular in developing countries. Oxidation ditches are usually equipped with large tank volume, and has lower dissolved oxygen (DO) concentration than the former system.

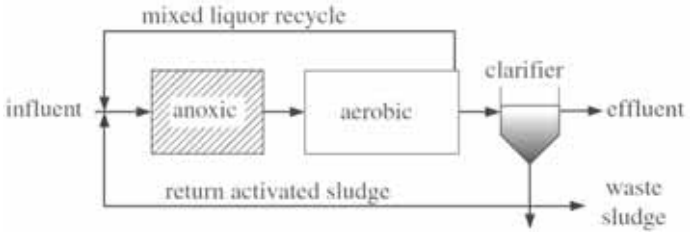

Fig.2 Diagram of a modified Ludzack-Ettinger system

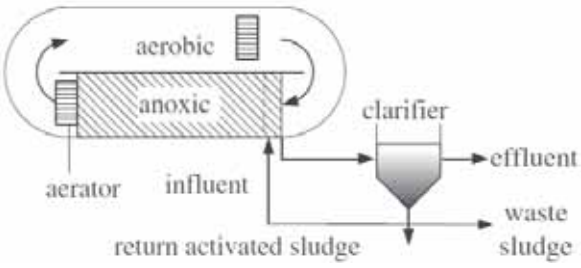

Fig.3 Diagram of an oxidation ditch

*Figures are from Law *et al*., 2012

In Thailand for municipal wastewater treatment, unlike Japan, oxidation ditches are more popular than modified Ludzack-Ettinger system. According to the system difference, N_2O emission level from wastewater section in Thailand can be different from that of Japan. It is said that oxidation ditch may produce less N_2O than modified Ludzack-Ettinger system because it has uniform DO concentration rather than frequent transitions. Moreover, other environmental condition such as temperature and influent contents can affect N_2O emission level. Therefore, I decided to set the objective to compare N_2O emission level from municipal wastewater treatment plant in Thailand.

[Theory and Method]

To get information about the N_2O emission level, I focused on microbial communities in the activated sludge derived from wastewater treatment plant. During the reaction pathway of biological nitrification and denitrification, each reaction step can be carried out by the microorganisms that have specific enzymes. The step of N_2O to N_2 is carried out by the denitrifiers that have nitrous oxide reductase (NOS) enzyme, and the enzyme is encoded by *nos* Z gene (Fig. 3). That means if the microorganism has the *nos*Z gene, it has potential to reduce N_2O into N_2. Therefore, I tried quantifying nosZ genes in activated sludge

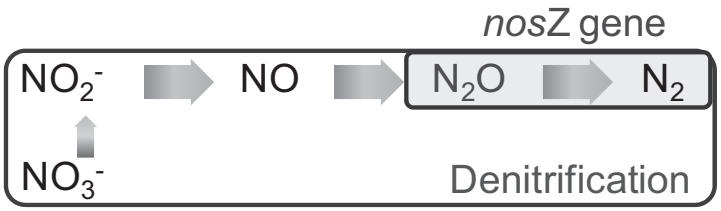

Fig. 3 The reaction step of N_2O to N_2 is carried out by the NOS, encoded by *nos*Z genes

During the field training in Thailand, we visited three municipal wastewater treatment plants; in Phuket, Ayutthaya and Bangkok. The former two plants are same oxidation ditch, but the plant in Bangkok is sequencing batch reactor and it has large capacity. I took sample of activated sludge from the plants in Phuket (Fig. 4).

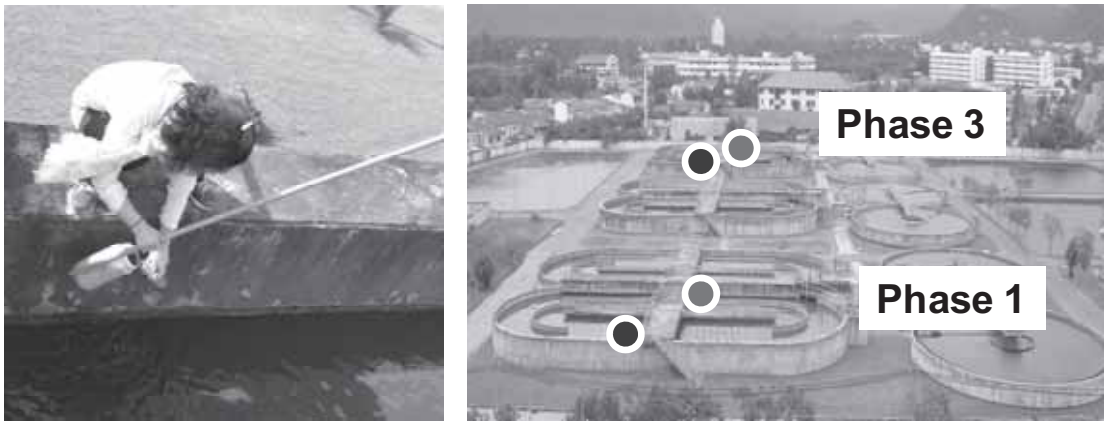

Fig.4 Sampling place (municipal sewage treatment plant in Phuket)

In the plant, there are three phases (a pair of bioreactors and sedimentation tanks) and I took activated sludge sample from both aerobic zone and anoxic zone in phase1 and 3, so that totally I took four samples. Methods in detail are as follows

① Take samples of activated sludge from municipal wastewater treatment plant in Phuket (31st July)
② Keep the samples with ice during the displacement
③ DNA extraction at Prof. Lek's laboratory in Kasetsart University in Bangkok (1st August)
④ Quantification of DNA using real-time PCR at my laboratory after coming back to Japan

The real-time PCR assay was carried out according to the method of Henry *et al.* (2006) with nosZ2 primers. In the 4th step, two types of DNA was quantified; genes that all bacteria have and *nos*Z genes. By calculating the ratio of all bacteria abundance and *nos*Z gene abundance, we can know what the ratio of microorganisms which can reduce N_2O to N_2 is.

(2) Findings and achievements obtained, significant experiences and lessons

[Results]

In the Table 1, the name of the samples and the sampling place is shown. After finishing quantification of both all bacteria and *nos*Z genes for each sample, the ratio was calculated. The result is shown in Fig. 5.

Table 1 Name of sample and sampling place

Name	Sampling place
P1 aero	Phase 1, aerobic zone
P1 anox	Phase 1, anoxic zone
P3 aero	Phase 3, aerobic zone
P3 anox	Phase 3, anoxic zone

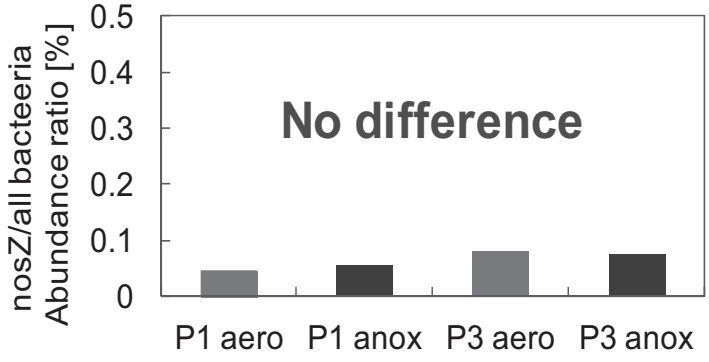

Fig.5 Results of *nos*Z/all bacteria abundance ratio[%]

From the results shown in Fig.5, we can know that there were no differences of *nos*Z abundance ratio between four samples. Before this field training, I have quantified the same value about the activated sludge

sample derived from municipal sewage treatment plant in Tokyo. It was modified Ludzack-Ettinger system, and the ratio was 1.8 (data not shown). By comparing these results gained from different system, it seems that, for this time, system in Japan has higher ratio of N_2O reducing bacteria than that of Thailand. Only from these data, however, we cannot conclude that N_2O emission from wastewater treatment plant is less in Japan than that of Thailand. The presence of DNA means that the microbial community has the potential of its function (e.g. if the community has *nos*Z genes, there are potential to reduce N_2O to N_2), but whether the function is active or not is unclear. To evaluate it, RNA can give us hints about the activity. For the evaluation of variety of N_2O emission due to the difference of treatment system, more research are needed, such as liquid analysis, RNA quantification.

[Findings]

From this field training, I found that it is important not only just get information about the place and their environmental problems but also visit the exact place and see what they have in their background. For example, the sewage treatment plant we visited in Phuket has received the leachate from the incinerator next to the plant. Perhaps there are some possibilities that heavy metals which are contained in the leachate have some effect for microorganisms in sewage treatment plant. In addition, average temperature in Phuket is higher than that of Japan, so that microbial community can be different from Japan. In the system we visited in Ayutthaya, one of the authorities said that it is difficult to construct a new plumbing because the city has been getting old. Such differences from own situation are difficult to be noticed unless we visit the place and see the real situation. To be a field-oriented leader in environmental sector, I would like to emphasize 'visit the place, see the background.'

(3) Achievements and its future vision

For my future career, I think I could apply two things which I learned from this field training.

First, I would keep it in mind to appreciate the cooperation of fellows or local people. During this training, there were many times that I couldn't do anything without someone's help. Without Professor Lek's help, I couldn't plan to take activated sludge sample from sewage treatment plant. Without Thai student's help who worked together in Phuket, I couldn't manage to keep sample with ice (because at airport there was a trouble that foreigner cannot bring ice box into plane). Also without their help, I couldn't communicate with Thai people who are not good at English. Therefore, I would never forget that we can carry out something abroad by the warm help of local people.

Second, I would listen to and see what they have in their background. I would like to understand their situation and propose appropriate solution for each area.

Someday if I get to be a member of factory and get a chance to visit developing countries, I would like to export treatment method that is suitable to the specific area as well as eco-friendly.

(4) Acknowledgement

This field training cannot be completed without many helps, including Professor Lek, student from Kasetsart university (Ploy), and also I would like to thank you all who participated in this field training and

who learned and saw the situation together. I really appreciate your support, not only for the project but also for significant daily life for two weeks.

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(Supervised by Associate Professor Akihiko Terada)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Study of Hydrogen production from Bio-ethanol for fuel cell in Thailand

Takami Yao
1st year of master's course, Applied Chemistry, Tokyo University of Agriculture and Technology
Destination and period: Thailand, Saraburi, 28th July-10th August

Key words: molasses, bio-ethanol, hydrogen, fuel cell, clean energy

Abstract (approximately 200 words)

I could know a lot of problems facing to Thailand and met a lot of people who are facing to such problems. From the experiment, I could confirm that hydrogen can be produced from the EtOH in Thailand. For the implement of this industry, it can be seen that the reduction of costs and further technology improvement would become future issue.
Also, through this field work, I could acquire new perspectives of thoughts and knowledge for my research as well.

(1) Contents and activities during the overseas field training (less than 600 words)

Title of this field training is "Investigation of hydrogen production of gasoline adding bio-ethanol for fuel cell in emergency in Thailand". Counterparts by Associate professor Kenichi Yoneda, Professor Tiwa Pakoktom, Professor Mohamad Pauzi Zakaria and Professor Pisit Maneechot from TUAT, Kasetart University, University Putar Malaysia, Naresuan University and Industrial office at Ayutthaya, Thailand.
Training schedule is as follows:

Jul 28th :Narita→Bangkok(Air), Bangkok→Phuket(Air)
Jul 29th :Visitation of Municipal Solid Waste Incinerator at Phuket
Jul 30th :Visitation of Hua-Hin Landfill at Hua-Hin
Jul 31st :Visitation of the Royal King's Project at Phetchaburi
Aug 1st :Visitation of Pyrolysis Plant at Samut Prakan
Aug 2nd :Visitation of Ayutthaya Landfill at Ayutthaya
Aug 3rd :Ayutthaya→Bangkok (Bus)
Aug 4th :Experiencing Local Lifestyle at a Sunday-Market

Aug 5th :Visitation of Sewage Treatment Plant at Bangkok

Aug 6th :Visitation of Bio-Diesel Plant at Saraburi

Aug 7th :Visitation of Bio-Ethanol Plant at Saraburi

Aug 8th :Visitation of Energy Park, Wongpanit and Village at Phitsanulok

Aug 9th :Visitation of Phichit Landfill and Sukhotai World Heritage Site at Phichit

Aug 10th :Bangkok→Narita (air)

What environmental problems I specified in this field is renewable energy with bioethanol.

Currently, Methane is used as fuel of steam reforming reaction for producing Hydrogen. However, even the fuel cell system from methane also can co-generate heat and electricity, the system is not able to use in emergency situation because methane is explosive gas. On the other hand, liquid fuel bioethanol what is biomass, low toxicity and ease to store have a hope to use as household power in emergency situation such as disaster in Thailand. The aim of my field work training in Thailand is to attempt Hydrogen reforming reaction with bio-ethanol which sampled from bio-ethanol plant there. Then propose the new practical usage of bio-ethanol in local area Thailand.

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

Ethanol derived from biomass is the promising candidate when discussing steam reforming of ethanol for producing Hydrogen in recycling society. The introduction of a bio-ethanol is linked to countermeasure of carbon dioxide reduction, energy self-sufficiency rate improvement and agricultural markets activation. Therefore how to supply and how to use bio-ethanol is a quite important issue. It has been used by adding to gasoline so far, though, because the existing system needs high purity ethanol production for it use, energy efficiency would be decreased until it would be the automobile fuel. On the other hand, it was found that bio-ethanol with low density (ca.30%) can be used as hydrogen source. Bio-ethanol (ca.30%) prevents energy loss from concentration-distillation processes. To accomplish the aim of this field work, I wanted to acquire bioethanol samples from the bioethanol plant in Thailand. I was thinking to test with 3 different concentration bioethanol from the plant as below.

① After fermentation (Before distillation)

② After 1st distillation (ca. 30%)

③ After the last distillation (ca. 99.8 %)

This is because I wanted to analyze and to compare the composition of ethanol and other impurities by gas chromatography, then to research if those ethanol (especially ca.30%) are able to use for steam reforming with electrical heating anodic alumina catalysts. After the active test from those samples I was planning to compare the ethanol conversion, H2, CO ,CO2 yield to the result which has already tested with denatured alcohol ones. From the result of the comparison, I will investigate if hydrogen production for fuel cells that can co-generate heat and electricity is possible in the early stages of the bioethanol distillation.

As a matter of fact, in order to accomplish the aim of this fieldwork, we visited bio-diesel in saraburi and Dr. Tharaphong from chulalongkorn university and also visited Bio-ethanol plant of MITR PHOL group in Suphanbri. For the sampling, we couldn’t acquire the bio-ethanol sample from the MITR PHOL company,

however Dr. Tharaphong provided us Bioethanol which he bought for his lab. That is to say, I couldn't acquire the 3 different bioethanol what I planned to sample. From this field work, I learned how much it is difficult to accomplish as what I planned to do in Japan. I obtained ③After the last distillation (ca. 99.8 %) bioethanol and bring back to Japan. Using this ethanol, I conducted activity test and durability test. Activity test is for to check if bioethanol can shift into Hydrogen. Durability test is for to check how long the reaction will last without deactivating the catalyst.

From activity test, the ethanol conversion rate C_{EtOH} [%] was calculated by $C_{EtOH} = \frac{F_{EtOH,\ inlet} - F_{EtOH,\ outlet}}{F_{EtOH,inlet}} \times 100$ [%]. $F_{EtOH,in}$ and $F_{EtOH,out}$ are the inlet and outlet ethanol flow rate [mol・s^{-1}]. From this results, bioethanol was confirmed to be react 100 % over 450 ℃. However, from the thermodynamic simulation results, it is known that 550 ℃ is the most suitable temperature for active test to suppress producing byproduct during reaction. So I conducted durability test under 550 ℃. After conducting durability test, it showed EtOH was kept to be convert 100 % for 65 hours (c.a 200 h) and70 % of outlet gas was Hydrogen. Making less of CO2 production is required as possible to have high selectivity of H_2.

I was glad to confirm that my study would be related to the co-generation of local area in southeast asia.

It could be better if the MITR PHOL group and TUAT had a contract for studying and I could get the 3 different condition samples.

(3) Achievements and its future vision (less than 400 words)

Acquiring samples was not so easy than I expected but I learned importance of correspond to the fact flexible. I could know a lot of problems facing to Thailand and met a lot of people who are facing to such problems. From the experiment, I could confirm that hydrogen can be produced from the EtOH in Thailand. For the implement of this industry, it can be seen that the reduction of costs and further technology improvement would become future issue.

As I mentioned in application form, in order to become technical leader who active part in the world, it is necessary to gain a lot of experiments which based on actual field research. Because I believe that such personnel can support both economic development and environmental protection. And this is the person image that I want to be in the future. Although Thailand is one of the famous countries for its tourism, this field work was good opportunity for me to see not only the gorgeous aspect but also to have been good chance for me to think about how and what we can involve to the environment problem which faces to the Thailand and Southeast Asia currently. Also, through this field work, I could acquire new perspectives of thoughts and knowledge for my research as well.

For the future I would like to work on this technology further and to implement to south east local regions for generated by itself sustainably and to be the real field-oriented leader..

(4) Acknowledgement

The author would like to thank Associate professor Kenichi Yoneda, Professor Tiwa Pakoktom, Professor Mohamad Pauzi Zakaria and Professor Pisit Maneechot from Kasetart University, TUAT, University Putra Malaysia, Naresuan University and Industrial office at Ayutthaya, Thailand for discussion and guidance on this work.

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(Supervised by Associate professor Kenichi Yoneda)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Study about measuring the CH_4 emission from sewage treatment plant, landfill and rice field with laser type sensor

Saori Umetsu
Master 1st, department of electrical and electronic engineering, TUAT
Destination and period: Thailand, July, 27 –August 15

Key words: GHG, methane, laser, measure

Abstract (approximately 200 words)

Emission of CH_4 causes global warming and it comes from the sewage treatment plant, paddy field and landfill. In this training, my study is measuring CH_4 concentration with laser type sensor in order to know CH_4 concentration on real time. On the field, I could get CH_4 concentration higher than CH_4 concentration world average. My aim in this field training is training my English and communication skill. My English skill and communication skill was improved. Above all I could get experience of international cooperation and culture to the good way in Thai. And I saw much Japanese company in Thailand. I realized of importance of seeking market in the world. My future vision is working for a Japanese company and help people with Japanese technology in the world especially the Asian countries.

(1) Contents and activities during the overseas field training (less than 600 words)

title : Study about measuring the CH_4 emission from sewage treatment plant, landfill and rice field with laser type sensor

Training schedule:

Month/Day	**Week**	**Place**	**Measurement**	**Other activity**
Jul.29	Mon.	Phuket	Sewage treatment plant	incinerator
29	Mon.	Bangkok→Kamphensain		

30	Tues.	Kamphensain→Phechaburi	Landfill	REO8
31	Weds.	Phechaburi→Bangkok		King project
Aug. 1	Thur.	Bangkok→Samut Prakan→Ayuthaya	landfill	Pyrilysis plant
2	Fri.	Ayuthaya→Municipality→Landfill→Ayuthaya	Landfill	
3	Sat.	Ayuthaya→Bangkok	Paddy field	
4	Sun.			
5	Mon.	Bangkok→Sewag Treatment plant→Bangkok		Sewage treatment plant
6	Tues.	Bangkok→Saraburi→Bangkok		Bio-diesel plant
7	Weds.	Bangkok→Suphanburi→Don Mueang → Phitsanulok		Bio-ethanol plant
8	Thur.	Phitsanulok	Paddy field	Energy park
9	Fri.	Phitsanulok→Sukhothai→Bangkok	Landfill	
10	Sat.			
11	Sun.	Bangkok→Ayuthaya		
12	Mon.	Ayuthaya	Paddy field	
13	Tues.	Ayuthaya	Landfill	
14	Weds.	Ayutthaya→Ratchaburi	Sewage treatment plant	
15	Thur.	Ratchaburi→Bangkok→Narita		

Training content: I measured the methane concentration at the place mentioned above; paddy field, landfill and sewage treatment plant. The measurement which I used this time is a measuring instrument using the lasers. And the measurement can measure the methane concentration immediately. Using this instrument, measure the methane concentration in the air of the Anaerobic zoon and Aerobic zoon in the sewage treatment plant, and the methane distribution within a square of 6m × 6m in the landfill, the changes in methane concentration with height and time in the paddy field.

Specify environmental issues in the area : they buries garbage without burning in landfills Thailand. Methane gas is generated from the waste in landfill. It is one of the factors of global warming. And this is also true in Japan; greenhouse gas is generated from sewage treatment plants, from the paddy fields. It is also one of the factors of global warming.

For landfill, I had considered that incinerator could decrease the amount of methane emissions. However to build incinerator in Thailand is difficult because of no funding and technique of building incinerator plants that toxic substance such as Dioxins sometime could not be emitted.

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

In order to be an environmental reader in Africa and Asia:

After field training in this time, I was impressed that many Japanese companies are active in Thailand.

In addition, there is a lively spirits in Thailand like other Asian countries; it was fun to just stay there. Speaking from the point of the environment, the most impressed things I got is the problem of landfill. I know that it is a matter of system of the country, but I was surprised that they do not burn garbage, smell from landfill and the people working there. Landfill was very dangerous to work there because there are some nails and other solid that hurt our foot.

It is not difficult for me now to reach out directly for environmental issues in Thailand. It is possible getting the knowledge of environmental issues and continuing the study of English in order to communicate with local people as day-to-day activities. In addition, I got many friends of international students, I would be able to talk about environment of each country and sometime discuss about that issues. It is important things to discuss about environmental issues with each other.

Overseas training is the better way to do that.

●Good point: During field training, it was really good that we went on with not only FOLENS members but also students of the same generation from Malaysia and Thailand. In addition, in this time, we trained so long, so that it was good time to become familiar friends not only for FOLENS members but also other countries members.

●Bad point: We moved in the van so many time. So we didn't walk there using our foot. Thus, I did not have a time to look at the map, so that it was not possible to grasp where we were. Because I did not check the map by myself as field training, I think that it is my fault.

(3) Achievements and its future vision (less than 400 words)

I improved the communication skills which is necessary for achieving cooperative work and cross-cultural understanding in the training of this time. The reason why I think so is this is first time to live together with Muslims and Hindus in training this time. I learned the importance of having to respect the religion of others by this experience, and also, touch the culture that I had not experienced until now.

From this experiences and the fact that I had been working with them in the measurement of their own, I could care about other person and improve communication skills in order to build a good relationship. In the future, I want to use outcome I got in this training , to work in companies that work internationally, and expand the market of Japan abroad. Of course, expansion of the market must be carried out in order to compensate the local need and help the local people. My major is electric and electronic field. I won't go overseas as market research because I would become a technician in the future. However, when I will have a chance to go to the site to manufacture, I will show my power of cross-cultural understanding and communication skills which I got in the training and build a good relationship with local co-workers. In addition, Japan has progressed technology for environmental issues as compared to the developing countries. It is easy to solve the environmental issues using my major technology of electric. I can solve the environmental issues professionally so much, but by using carefully a limited energy, I want to approach to environmental issues. In addition, my future dream is to work at the company involved in the plant factory. I went to the supermarket in this time in Thailand, despite bad freshness, lettuce which is highland vegetables are sold at high price. I believe that there is also the demand of Thailand plant factory from this point. It may be able to open up the market in Southeast Asia in the future. If food was produced near the area of consumption, the amount of carbon dioxide emitted during transportation will be reduced. In addition, there is the area not enough water, the area not suitable for agriculture and the area becoming lean. It is possible to prevent water consumption and becoming soil poor if the plant factory is installed in such area. I want to work in the field of international and environment as described above.

(4) Acknowledgement

I would like to thank FOLENS for giving me such activities about international environmental issues. In addition, I am grateful for FOLENS clerks, teachers and foreign universities teacher Dr. Tiwa, Dr. Pauzi who had been preparing this field training. In particular, thank Dr. Yoneda who adviced about various measurement of my activities, Mr. Takemura, who helped me to measure, Poo, Pika and Mr. Matsushita. Thank you everyone in oversea university I met, local people and other Folens members.

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Home page of Dr. Takayanagi in TUAT: http://kenkyu-web.tuat.ac.jp/Profiles/1/0000018/theses1.html

(Supervised by Kenichi YONEDA)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Study for Measurement Methods of Methane Gas Distribution with Laser in Thailand Landfill

Ryuichi Takemura
Doctoral course, Bio-application and Systems Engineering
Thailand, 2013, July 27-August 16

Key words: Landfill, Greenhouse Gas, Methane Gas, Laser Methane Detector,
Gas Distribution Mapping,

Abstract (approximately 200 words)

My final goal is to develop a mapping system of methane gas emission rate in landfill. Methane gas greatly effects on global warming and landfills are one of main human-related source of the gas. To take appropriate countermeasures for the gas emission, evaluating the gas emission rate from the landfill is needed. Especially, the understanding of location where the high concentration gas are emitted is important when deciding the gas emission monitoring points, because without the information the gas emission rate can be over or under estimated [1-2]. In robotic studies, several gas mapping methods using laser methane detector (LMD) have been developed (**Figure 1** and **Figure 2**). However applying the robotic technologies to the developing countries is not acceptable due to lack of finance or of well-trained engineer. Thus in this training, I tested three different gas mapping methods by using human-hand instead of using robot, and evaluated their efficacies. Through this training I experienced difficulties of translating high level technology such as robotic technologies to the developing countries and importance of understanding of local situations

Figure 1 Methane gas mapping robot using LMD[3]

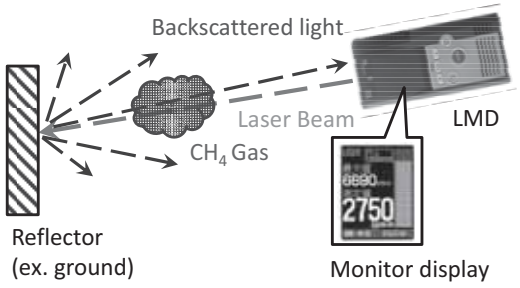

Figure 2 Schematic of LMD measurement. Integrated methane gas concentration value of light path can be measured.

when applying the technologies to the countries. Because of my future dream being the international engineer who helps transferring technologies of developed countries to developing countries, these experiences obtained in this training are very useful for making my future vision concrete.

(1) Contents and activities during the overseas field training (less than 600 words)

[Title]

Measurement of Methane Gas Distribution with Laser Methane Detector in Thai Landfill

[the counterparts and professors]

Professor Mohamad Pauzi ZAKARIA and his students [University Putra, Malaysia]

Professor Tiwa PAKOKTHOM and his students [Kasetsart University, Thailand]

Professor Pisit MANEECHOT and his students [Naraesuan University, Thailand]

Especially, students of Professor Pauzi, Syafika Zamri and Poorani Krishnan, and students from Tokyo University of Agriculture and Technology (TUAT), Saori Umetsu, Harakhun Tanatavikorn and Professor Hirokazu Ozaki from TUAT helped gas concentration measurement in landfills.

[Training schedule]

28 Jul. Koganei → Narita Airport → Bangkok → Phuket

29 Jul. Phuket

Visited at Phuket Waste Water Treatment Plant (WWTP) and MSW Incinerator and assisted the other student's work to measure the methane gas concentration at WWPT.

30 Jul. Phuket → Bangkok → Hua-hin

Visited at Hua-hin Landfill and tested three gas mapping methods.

31 Jul. Hua-hin → Phetchaburi → Bangkok

Visited at Laem Phak Bia: Royal King's Project

1 Aug. Bangkok → Samut Prakan → Bangkok

Visited at Eastern Energy Plus co. Ltd.

Visited at Samut Prakan Landfill and measured the aerial methane gas concentration in the landfill.

Figure 3 Photos of counterparts and professors (left) and two Malaysian students helping my work (right).

2-3 Aug. Bangkok → Ayutthaya → Bangkok
Visited Ayutthaya Municipal Office and presented the idea of my project to works there. Visitation of Ayutthaya Wastewater Treatment Plant, Landfill, and Rice Fields and helped other student's work to measure the methane gas emission from the rice field.

4 Aug. Bangkok
Experienced local city-life in Bangkok (Sunday Market)

5 Aug. Bangkok
Visited at Bangkok Waste Water Treatment Plant

6 Aug. Bangkok → Saraburi → Bangkok
Visited at Chulalongkorn University Biomass Research Center

7 Aug. Bangkok → Suphanburi → Bangkok
Visited at MITR PHOL Bio Ethanol Plant

8 Aug. Bangkok → Phitsanulok
Visitated of Naraesuan University Energy Park, Wongpanit Recycling Facility, and Khao Noi Village

9 Aug. Phitsanulok → Sukhothai → Bangkok
Visited at Phitsanulok Landfill and Sukhothai World Heritage Site. I measured the aerial gas concentration in the landfill.

10-11 Aug. Bangkok
Experienced local city-life in Bangkok (Sunday market and Siam square)

12-13 Aug. Bangkok → Ayutthaya
Visited Ayutthaya landfill and measured aerial methane gas concentration.
Assisted other student's work to measure methane gas emission from the rice field and the WWTP.

14 Aug. Ayutthaya → Bangkok
Assisted other student's work to measure methane gas emission from the rice field and the WWTP.

15 Aug. Bangkok →Ratchaburi
Visitated of Regional Environmental Office 8

16 Aug. Ratchaburi → Bangkok → Narita Airport→ Koganei

Training content

(1) Testing three methods for methane gas mapping using LMD in landfill and evaluating their efficacies.
(2) Experiencing and practicing cooperation with international counterparts.
(3) Understanding the background of environmental issues in Thailand.

- Through this trip, I realized that concentration of methane gas emitted from landfill was quite high especially at Hua-hin. The methane gas emission can be reduced by appropriate management of

damping site. However it was difficult to say that the landfill was appropriately managed. My Thai friend told me that one big causes of this insufficiency of management was the lack of financial support from the government. I then thought that we need to change Thai people's motivation for reducing methane gas emission and consequently need to change the governmental direction. Japan, as a developed country, can contribute to this from both educational and technological sides. For example, if Japanese scientist or engineer go to Thailand and teach local students about the importance of environmental point of view. Also, if Japanese universities or government arrange systems that promote Thai students to be able to study in Japan easily, we can transfer them technologies that are useful for reducing environmental problems.

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

My findings or achievement in this training can be summarized into two points;

(1) Confirming that one gas mapping method of three has potential to be used in real landfill site.

(2) Too much persistence to his or her specialty might prevent researchers from the efficient solution.

(1) Three gas mapping methods were tested in 6 m × 6m flat place shown in **Figure 4** in Hua-hin landfill. The measurement site was separated to 36 cells; size of each cell was 1 m^2.

I tested three methods there. Details are described below.

- Method #1 (**Figure 5 (a)**): A man having LMD stands at one cell and points each cell to measure the total gas concentration between detector and the pointed site. The gas map was calculated by solving simultaneous equations.
- Method #2 (**Figure 5 (b)**): One man carrying LMD stands at a boundary of measurement site and another person carrying reflector plate stands at opposite boundary. They walk along the boundary edge to make the light pass sweep the all measurement site. The gas map is estimated, based on maximum a posteriori algorithm.
- Method #3 (**Figure 5 (c)**): One man carries LMD and points the ground where he stands. Then he moves to every cell. The gas map is obtained by calculating gas concentration contour.

The gas flux from the ground was measured at the same time by closed chamber method shown in **Figure 6** to evaluate LMD measurement validity [1]. Gas chamber was set to five points and we sampled gas in the chamber at every three minutes. The concentrations of sampled gas were measured by gas chromatograph after coming back to Japan. We finally calculated regression line between gas emission rate of each cell obtained from chamber methods and gas concentration map obtained from LMD measurement. The gas emission maps of the LMD were recalculated by based on that regression lines.

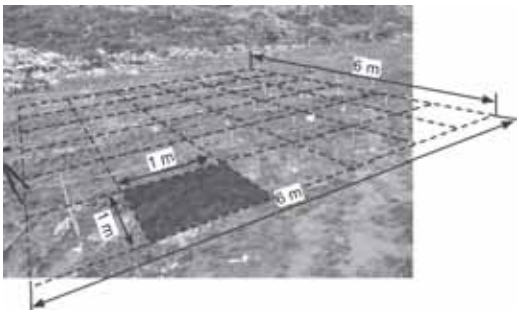

Figure 4 Photo of measurement site. Flags were put at the center of each cell. Cells are virtually shown in the photo. Temperature of the day was 28 °C. Weather was cloudy with occasional rain.

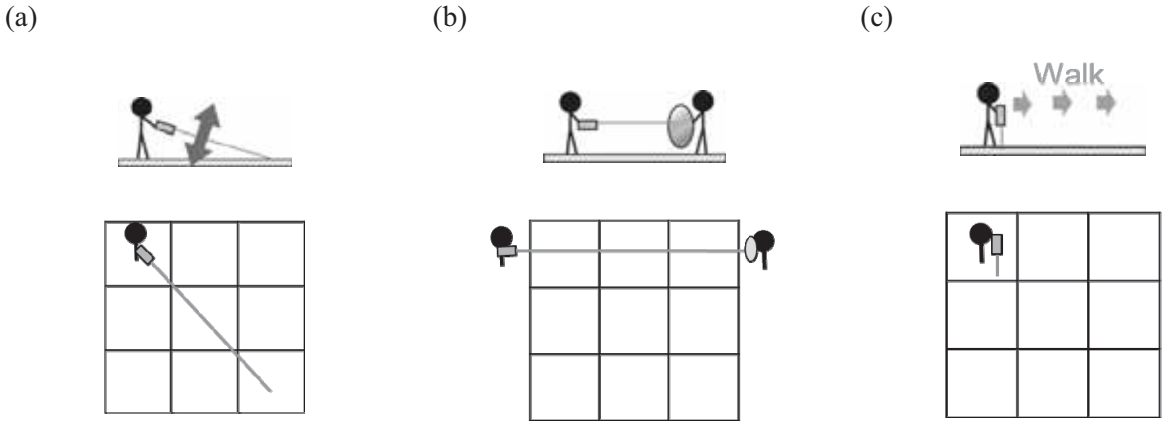

Figure 5　Schematic images of methane gas mapping methods; method #1 (a), method #2 (b) and method #3 (c).

The gas map obtained from method #1 is shown in **Figure 7 (a)** also maps of method #2 and method #3 which are recalculated based on the regression lines obtained from chamber method are shown in **Figure 7 (b) and (c)**. Furthermore the gas map obtained from chamber method is shown in **Figure 7 (d)**. Result of method #1 show unrealistic value (minus gas concentration value). This is probably because wind change of speed and direction. Measurement of method #1 took 90 min which is longer enough for the wind to effect on the gas distribution.

Comparing the gas emission maps of method #2 and method #3 with the result of chamber method, the result of method 3 generally corresponds to that of chamber method. Although, further tests of the gas mapping methods in much larger area are needed, method #1 is thus expected to apply on real landfill site. This result indicates the possibility of mapping gas emission rate by human-hand using LMD.

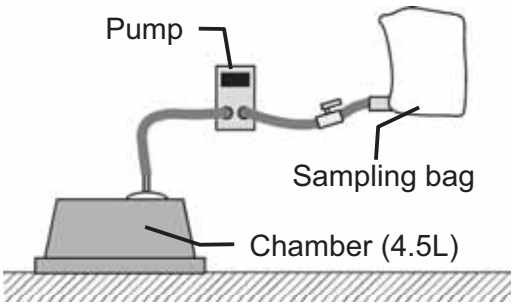

Figure 6　Schematic of chamber method. The inside of chamber was kept at atmospheric pressure by the pressure adjustment bag so that the gas can be emitted from the ground.

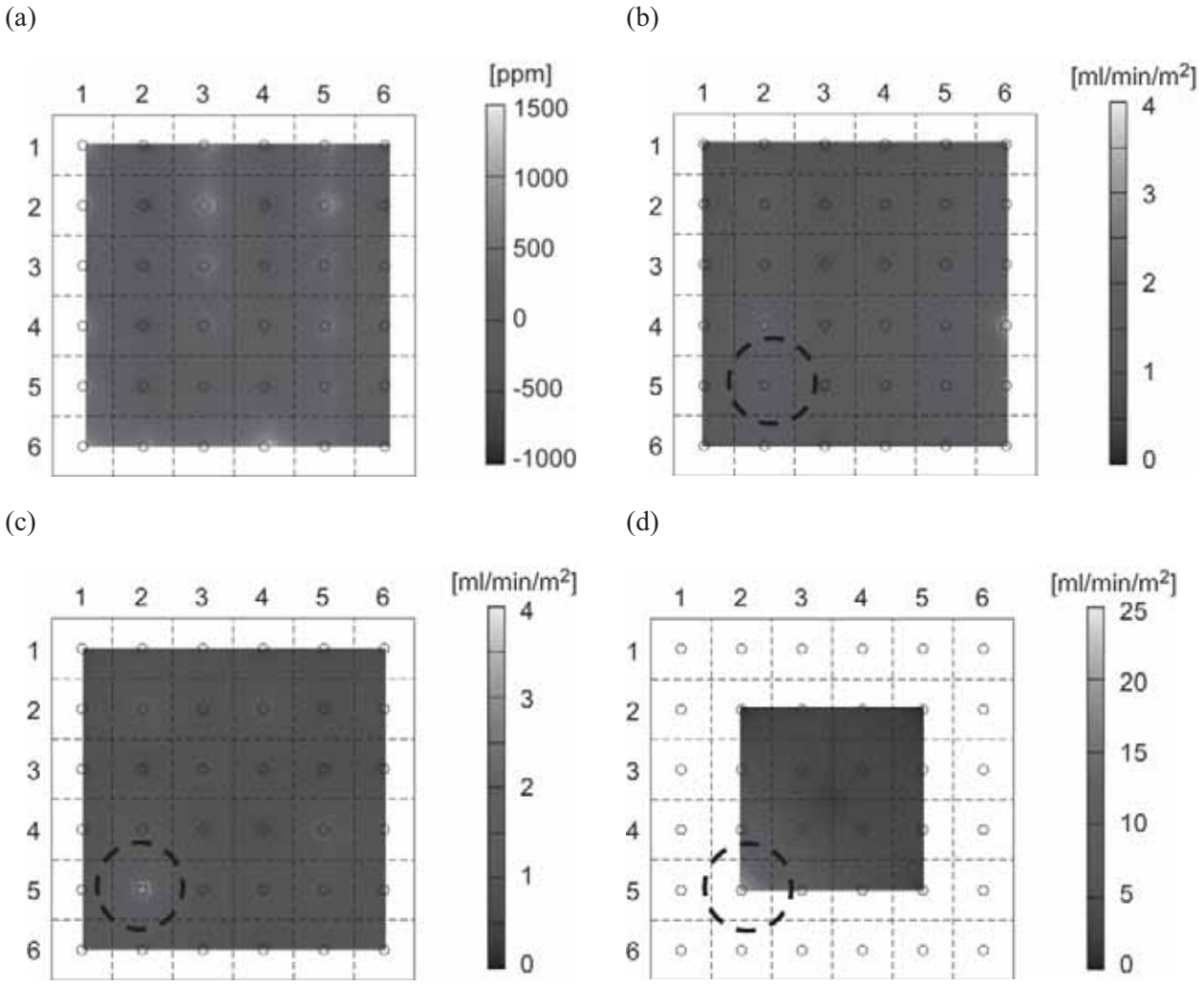

Figure 7 The gas concentration map obtained from method #1 (a). The gas emission map obtained from method #2 (b), method #3 (c) and chamber method (d).

(2) Other finding of this training is that too much persistence to his or her specialty might prevent researchers from the efficient solution. Through my three years study of robotics, I was sure that robotics could contribute to the environmental problem. Because there are the problems that can be solved only by robots, for example investigating dangerous places. Also they can operate some works in short time and with less mistakes compared to human operation.

I often feel that a first priority of my studying field, robotics, is creating high robotic technologies and thus I got used to propose applications based on the idea of utilizing robot. Therefore, I also in this training forced myself unconsciously to put robots at the center of application concepts for environmental problems.

Because of this too much persistence to my major robotics, I overlooked the fact that robots require great deal of money and well trained engineers. Under the situation where these two conditions cannot be satisfied, we have to look for other solutions which are not limited to robotics.

Of cause, it is important for researchers to keep enhancing one's specialty since it has scientific

significance and it also has the possibility to solve the environmental problems in the future. But too much persistence to our specialty makes us blind to the true nature of problems.

(3) Achievements and its future vision (less than 400 words)

My future dream is to help transferring technologies such as solution for environmental problems from Japan to developing countries and to make their life in developing countries better. When I finish my doctoral degree, I plant to enter academic field to do both research and education. Through research, I would like to develop the systems which are useful for solving environmental problems. Developing methane mapping system will be the first step of this. And through education, I would like to transmit these technologies to the students in developing countries.

The experience of this trip was great beneficial to find both important hints to realize my future dream and I also realized my current ability limitation to solve the environmental issue. I learned some important viewpoints which are needed when working in international field. In this training, I mainly worked with Thai and Malaysian students and I needed to explain about the procedures and significance of my measurement to them in English. Through this, I feel importance of not only English communication skills but also straightforward way to explain technical things. To do this I understand that deeper understanding of technical things is really important and I have to learn more about technical field, which are my future issue.

(4) Acknowledgement

I would like to show my deepest appreciation to the FOLENS program for providing me with the chance to participate and financial support in this overseas field training. I would like to thank all the FOLENS staff and their local counterparts for organizing and supervising this training. In particular I would like to thank Associate Professor Kenichi Yoneda for his constant support and supervision during the trip. I would also like to thank to Haryy-san, Umetsu-san, Pika and Poo. Without their help I could not completed my measurement work in the landfills.

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(Supervised by Professor Kenich Yoneda)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Investigation and Study of Municipal Solid Waste Management in Thailand

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School grade, Applied Chemistry, Engineering
Thailand: 2013, July 27 – August 16

Key words: Municipal Solid Waste, Landfills, Waste Treatment, Thailand

Abstract

This study investigates the current situation of Municipal Solid Waste (MSW) management in Thailand. The following relevant sites were visited and many discussion held with experts from various organizations to obtain relevant MSW management system data:

1) Landfill sites at Hua-hin, Samut Prakan, Ayutthaya, and Phitsanulok
2) Ayutthaya Municipal Office
3) MSW Incinerator at Phuket
4) Regional Environmental Office subdivision 8 (REO8) at Ratchaburi
5) Chulalongkorn University Biomass Research Center at Saraburi
6) Wongpanit Recycling Center at Phitsanulok

The result of the investigation and study of the municipal solid waste management in Thailand yielded the following insights:

- Population participation in reduction, reuse, and recycling of MSW is highly dependent on financial incentive.
- Current national and local legal framework does not promote reduction, reuse, and recycling of MSW. At times the enforcement of such legal framework worsens the situation of local population.
- Current MSW management system is not sustainable. Net cash flow of the system is estimated negative, resulting in the government having to cover the difference in expense.
- Strong financial incentive is required to initiate major changes in people's behavior and the existing MSW management systems.
- Hidden population, such as tourists, that fluctuates on a seasonal basis further complicate MSW management for major cities in Thailand.

The aim of this study is to determining the weakness in the current MSW management system that

makes it unsustainable.

(1) Contents and activities during the overseas field training (less than 600 words)

Investigation and Study of Municipal Solid Waste Management in Thailand

Counterparts

Professor Tiwa PAKOKTHOM [Kasetsart University, Thailand]

Professor Pisit MANEECHOT [Naraesuan University, Thailand]

Professor Tharapong VITIDSANT [Chulalongkorn University, Thailand]

Professor Mohamad Pauzi ZAKARIA [University Putra, Malaysia]

Training Schedule

28 Jul. Koganei → Narita Airport → Bangkok → Phuket

29 Jul. Phuket
Visitation to Phuket Waste Water Treatment Plant and MSW Incinerator

30 Jul. Phuket → Bangkok → Hua-hin
Visitation of Regional Environmental Office 8 (REO8)
Visitation to Hua-hin Landfill

31 Jul. Hua-hin → Phetchaburi → Bangkok
Visitation of Laem Phak Bia: Royal King's Project

1 Aug. Bangkok → Samut Prakan → Bangkok
Meeting with Eastern Energy Plus co. Ltd. (EEP)
Visitation of Samut Prakan Landfill

2-3 Aug. Bangkok → Ayutthaya → Bangkok
Meeting with Ayutthaya Municipal Office
Visitation of Ayutthaya Wastewater Treatment Plant, Landfill, and Rice Fields

4 Aug. Bangkok
Experiencing Local City-life in Bangkok (Sunday Market)

5 Aug. Bangkok
Visitation to Bangkok Waste Water Treatment Plant

6 Aug. Bangkok → Saraburi → Bangkok
Visitation of Chulalongkorn University Biomass Research Center

7 Aug. Bangkok → Suphanburi → Bangkok
Visitation to MITR PHOL Bio Ethanol Plant

8 Aug. Bangkok → Phitsanulok
Visitation of Naraesuan University Energy Park, Wongpanit Recycling Facility, and Khao Noi Village

9 Aug. Phitsanulok → Sukhothai → Bangkok
Visitation of Phitsanulok Landfill and Sukhothai World Heritage Site

10 Aug. Bangkok
Rest at my House in Bangkok

11-16 Aug. Bangkok → Ratchaburi → Bangkok

Assisting Umetsu-san and Matsushita-san with their overseas field training topics

Content and Activities at Relevant Sites:

Phuket Waste Water Treatment Plant and Incinerator

The Phuket Waste Water Treatment Plant is located beside the Phuket MSW Incinerator. MSW leachate from the incinerator feed storage is sent for treatment at the waste water treatment facility. Both facilities were operated by private companies under concession contract with Phuket municipality; *Eastern Thai Consulting 1992 co.Ltd* operates the waste water treatment plant and *PJT Technology co.Ltd* operates the incinerator.

An interview was held with the operator of the Incinerator. Some operational and financial data was collected from the interview along with his opinions on the viability of incinerator technology for Thailand.

The incinerator system is designed to generate a maximum of 14 MW of electricity using two 7 MW generators. The capacity of the facility is 700 tons/day. It currently treats an average of 650 Tons of MSW per day. Unfortunately the actual electricity generation is at approximately 10 MW. This yields an incinerator combustion efficiency of approximately 71%, which typically should be higher than 80%. The operator stated that the low efficiency was due to problems in controlling of the temperature furnace. This is due to the nature of the composition MSW waste (unsorted) fed to the incinerator system. It is interesting to note that in the year 2012, when Professor Yoneda visited the incinerator, the combustion efficiency was around 57%. A combination of activated carbon and bag filters is used to treat the incinerator emissions containing.

A subsidiary company of *Guangdong Machinery Import & Export Co., Ltd.* (GMG), *GMG International Engineering & Equipment Co., Ltd* (GMGIEEC) was responsible for the design, procurement, installation, and training of the incinerator. The facility started operating in March 2012. Unfortunately, due to low efficiency after startup of the facility, Japanese experts from *TESCO Co., Ltd.* were contracted to troubleshoot and improve the operation at Incinerator. The current operator of the facility is *PJT Technology co.Ltd.*

Regional Environmental Office 8 and Hua-hin Landfill (REO8)

The REO8 is located in the province of Ratchaburi. The Hua-hin landfill is one of several that they monitor and study. The landfill receives waste from the Hua-hin resort town, which is a popular tourist destination. It was initially designed and engineered to be a sanitary landfill, but due to prolonged use it has become a controlled dumping landfill.

An interview and discussion was held with the expert from REO8, Mr. Prasart Chatchairat, on the condition and operation of the Landfill. The location of the landfill is relatively close to an agriculture plantation and housing complex. Data was collected on the quantity and composition of waste, shown in **Table 1**. Additionally my personal impression of each individual landfill site is presented in **Table 3**.

The Royally-initiated Laem Phak Bia Environmental Study, Research and Development Project

The Project was initiated to study alternative models and methods of waste water treatment and garbage disposal that suited the conditions found in Thailand. The project has been widely recognized for its capacity to treat the waste water in the municipal area of Phetchaburi Province and to create knowledge concerning the development of the model for waste water and garbage disposal which is effective and suitable to the environment. The project is open to visitation for the public and aims to spread knowledge on natural waste water treatment and garbage disposal.

A discussion on the collection and treatment of waste from wet markets and communities was held with the project representative. Particularly interesting, is the use of garbage to make compost by landfill method in the Concrete Box that suits Thailand's climate was demonstrated by the project.

Eastern Energy Plus Co. Ltd. (EEP) and Samut Prakan Landfill

The company is one of the many in Thailand that focuses on implementation of waste-to-energy technologies on a commercial scale. They have recently purchased the Samut Prakan landfill site and aim to generate a variety of products from the accumulated landfill MSW and new MSW that enters the site on daily basis. These products are oil (from plastics), refuse derived fuel, and electricity. Samut Prakan landfill has been in operation for over 30 years and was initially

designed as a sanitary landfill. It recives waste from the Samut Prakan province and some Bangkok metropolitan districts. Overuse of the landfill site has changed it into a controlled dumping site. It is one of the largest landfill sites in Thailand.

A discussion with the company revealed the challenges that private companies face when starting up such a business in Thailand. Data on the quantity and composition of the Landfill MSW was obtained from the company. Some financial information was also provided by the company. The collected information can be seen in **Table 1**. Additionally my personal impression of each individual landfill site is presented in **Table 3**.

Ayutthaya Municipality Office and Ayutthaya Landfill

Ayutthaya city is one of Thailand's major tourist attractions. A major industrial complex devoted to the production of automobile parts is located close to the city. This results in a surprising high amount of base population and hidden population. The Ayutthaya Landfill site receives MSW from Ayutthaya city and the surrounding districts. It is currently operating in as a controlled dumping site. In addition to this, the landfill site for Ayutthaya city is irregularly shaped and was purchased in the past from a private owner. This results in difficulty in the operation, management, and expansion of the landfill site.

An interview with the workers revealed the issues they faced operating the landfill. They cited lack of personnel, equipment, and financial support as the main issues. Additionally an interview with the Ayutthaya municipality provided insight on the structure of the legal framework regarding the responsibility of the waste collection and disposal. Data was obtained from the Ayutthaya municipality on the quantity and composition of the municipal solid waste, which is presented in **Table 1**. Additionally my personal impression of each individual landfill site is presented in **Table 3**.

Chulalongkorn University Biomass Research Center

The biomass research center researches the various utilization of biomass and up-scaling of these projects to pilot scale. Main projects of interest were the production of bio-diesel from waste cooking oil and utilization of agricultural waste to produce bio-gas, briquette charcoals, and activated carbon.

Wongpanit Recycle Separation Plant

Wongpanit facilitates the collaboration for collection, sorting, and distribution of recyclable material from various parties. They also provide education-training program in waste separation. Aiming to challenge conventional view of MSW, the founder of the organization made an impressive statement: “There is no such thing as actual waste, but just misplace resources.”

A presentation by the staff at the facility and a discussion with them provided excellent information on the recycling business. The staff provided information on the separation process, some financial information, and their philosophy towards waste. Information on the price of each material is presented in **Table 2**.

Phitsanulok Landfill

The Phitsanulok Landfill was initially a Thai test case for the application of Mechanical Biological pre-Treatment (MBT) of solid waste prior to landfill. It was part of the Thai-German solid waste management program for Phitsanulok. This type of treatment is very popular in Europe. The aim of the MBT process is to reduce the smell and volume of the incoming MSW so that less space is needed for landfilling. It operates on a simple concept; ensure that aerobic decomposition takes places in the mixed MSW. The decomposition is controlled by supplying air (oxygen) and controlling the moisture in the MSW.

Additionally the MSW is arranged into a specific shape (length, width, height) that facilitates the decomposition. This ensures that the MSW decomposes at a relatively fast speed and prevents the generation of methane (anaerobic decomposition).

We were presented details on the MBT process and financial data by the staff of the Phitsanulok Municipal Office. Additionally the staff explained to us the reason why such an excellent process has not been adopted by other municipalities in Thailand. The Phitsanulok landfill site gave me positive impression compared to the previous landfill sites. The cooperation with developed nations to develop custom solutions for Thailand's MSW issues is another crucial activity. **Table 1** shows the information of the Phitsanulok landfill site. Additionally my personal impression of each individual landfill site is presented in **Table 3**.

Conclusion

Thailand's current MSW management system is unable to handle the ever-increasing quantity of waste generated from our developing society. As Thailand continues to develop and cope with increasing demands by the population, it has turned to developed countries for guidance and inspiration. Unfortunately what is often assessed is the technological aspect (disposal/treatment). This is not solving the problem at its roots, but just addressing the symptoms. In order to tackle this challenge, Thai society's environmental awareness and responsibility needs to increase. The various projects during this trip aim to accomplish this. Particularly impressive is the Wongpanit Organization and the Phitsanulok landfill site. Until Thai society is as discipline as Japan or Europe such a private organization is necessary to provide the initial incentive and education for people to separate their waste.

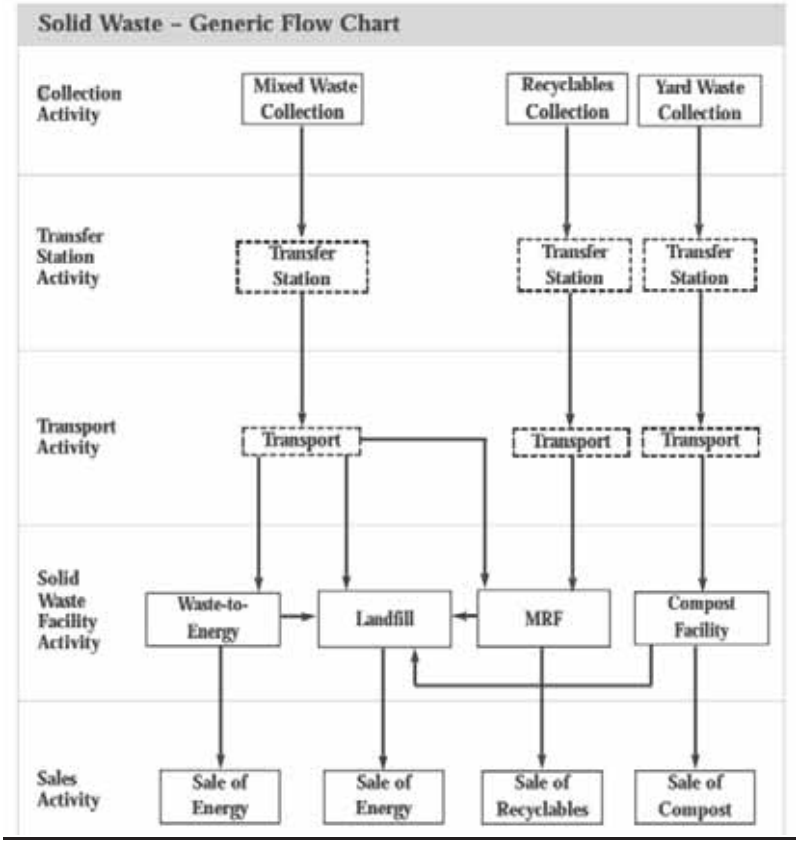

Figure 1 – Generic Flow Chart of Solid Waste (Environmental Protection Agency, 1997)

Collected Data

Table 1 – Overview of data collected from various landfill sites.

Landfill Site		Municipal Solid Waste Landfill Data							Financial Data		
		Quantity		Composition (%)							
Location	Age (years)	Current (tons)	New (t/day)	Organics	Plastics	Paper	Metal	Others	Tipping Fee (THB/ton)	Landfill Worker Salary (THB/day)	Household Fee for Waste disposal (THB/month)
Hua-hin[1]	15	400,000	90-100	48	17	12	<1	22	400	300	20-40
Samut Prakan[2]	30	5,000,000	1200	43.21	23.70	14.32	0.29	18.48	500		
Ayutthaya[3]	37	300,000	150	48.27	15.91	11.68	1.35	22.79	400		
Phitsanulok[4]	15	250,000	200	44.4	29.8	0.6	1.4	23.8	385-485		
Phuket[5] **(2004)**	-	-	370	44.13	15.08	14.74	3.44	22.61	300	-	
Phuket[5] **(2010)**	-	-	600	47.56	18.43	5.26	<1	28.75	520	-	
Bangkok[6]	-	-	11,138	42	25	11	2	20	-	-	
National Average[7]	-	-	43,064	64	17	8	2	9	300-500	-	

[1]Data on MSW composition was obtained from an interview where approximate numbers were cited from a past study conducte wasd by REO8 (2005)

[2]Data on MSW composition was obtained from a study conducted by Chulalongkorn University (2011)

[3]Data on MSW composition was provided the Ayutthaya Municipal Office, exact year of data collection was not provided.

[4]Data on MSW composition was provided by the Phitsanulok Municipal Office. These were from a past study conducted by Asian Institute of Technology. The exact year in which the study was conducted is unclear, but estimated to be in 2004 – 2010.

[5]Data on MSW was obtained from studies by King Mongkut's University of Technology. The year 2010 data was on the Phuket Incinerator visitor brochure.

[6-7]Data on MSW was obtained from literature (ISBN 978-979-1344-78-4) published by the Society of solid waste management experts in Asia and Pacific Islands (SWAPI). The data was collected in the year 2005 – 2008.

Table 2 – Wongpanit Organization purchase price list of Recyclable Materials

Recyclable Material	Price/unit (THB)
Carton Box	3.10
Steel	7.90
Glass	1.40
Mixed Plastic	7.00
PET Plastic	12.00
Aluminum Can	33.00

*A detailed classification and pricing is available on a daily basis on the Wongpanit Organization website.

Table 3 – Personal Impression of Landfill sites (Ranking)

Landfill Site	Evaluation Criteria				Overall Impression
	Visual Impression	Smell	Presence of Scavengers	Operation of Landfill Site	
Hua Hin*	3	4	4	4	4
Samut Prakan	2	2	2	1	2
Ayutthaya	4	3	3	3	3
Phitsanulok	1	1	1	2	1

*There was rain on the day we visited the Hua Hin landfill, worsening the present condition of the landfill site. This has influenced my impression of the Hua Hin Landfill site.

Table 4 – Ayutthaya City demographic information (Ayutthaya Municipality Office, 2013)

Population		Quantity	
Residents according to registry		54,415	People
Households according to registry		18,452	households
Hidden population	Tourists	200,000 (combined estimate)	people
	Labor		

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

This trip has revealed to me an even deeper connection between established national policies and environmental issues. The current legal framework, both on a local and national level, does not promote environmental awareness and responsibility in the population. In a discussion with Mr. Prasart (REO8), he gave me several example and instances where the government selectively enforces the law to suit its need. It is a classic case of government agencies being above the law. He further explained why they are sometimes reluctant to enforce these laws.

"Imagine this, there's a power plant near a residential area. It is currently operating at full capacity to supply the people with much desired electricity. Routine inspection by the Pollution Control Department (PCD) shows that due to operating at maximum capacity, the environmental limits on pollutant have been exceeded. Here's the dilemma; if PCD shuts down the plant citing violation of environmental regulations, the people in the area suddenly find themselves without electricity. And you can be sure that they will complain and start blaming the government. So what would you do? You have no alternatives, essentially you're stuck in a 'Lose-Lose' situation." – *Mr. Prasart Chatchairat*

Another excellent example is the issue of waste separation. Households only pay 40 THB/month to dispose of their waste. This waste is placed in a trash can close to the house and collected 2-3 times / week. The dump truck comes to pick up the waste and takes it to the disposal site. The people see this and realize that there is no point to waste separation due to everything ending up in the same destination. While the government states that; "Since people are not separating their waste, there is no point in building facilities to received separated waste." There is no monetary or social penalty (enforcement) for the government or people. There is also no reward for the separation of waste. Thus it becomes the norm that it is not necessary to separate waste.

An interesting topic is the cost of the current MSW management system. Mr. Krisana Kaiyasit, administrator of the Ayutthaya Municipal Office, explained that existing MSW management system has to accommodate not just local population of that area, but also a large hidden population. These are comprised mainly of tourists and temporary factory workers. Estimates made by the Ayutthaya Municipal Office are shown in **Table 4**. This makes it difficult to estimate and manage the costs of MSW management systems. Although landfill is the cheapest disposal method, it is not sustainable long term. You will run out of space eventually. In order to change any methods a large amount of investment is needed. The current MSW management systems source of income is through the household disposal fee and fees collected commercial entities (hotels, department stores, etc.). Mr. Kanapod Nitsiriphat, the CEO of EEP co. Ltd., stated that this fee is insufficient to finance even 10% of the operating cost. Thus the MSW system requires a large operation and maintenance upkeep from the government budget. Adding corruption and embezzling to the equation further highlights that the current MSW management system a liability to the government budget. It is not sustainable.

The rising cost of operating and maintaining the current MSW management system has led to the high government interest in waste-to-energy technologies. **Figure 1** shows a generic MSW flowchart. In an attempt to resolve Thailand energy challenges and waste problems simultaneously, the government has tried

to promote commercialization of waste-to-energy technologies by offering financial incentives. These are in the form of government subsidies or guaranteeing purchase price of product (electricity/oil). Unfortunately the characteristics of Thailand's MSW hinder the efficient conversion from waste-to-energy. Local climate (moisture), MSW composition, and poor waste separation are some of the issues that prevent the widespread commercialization of waste-to-energy technologies. Ms. Wimonrat Santadvatana, international coordinator of Wongpanit Organization, further stated that increased waste separation and recycling is necessary to accelerate the adoption of waste-to-energy technologies. At the very least it is necessary to separate organic and in-organic waste. Wongpanit Organization has been highly successful in promoting the separation of waste in the Phitsanulok province though financial incentives. They have established themselves as sorting and recycling experts of the region and share that expertise by providing training/education to the public. The representative from the Phitsanulok municipality staff stated that:

"The waste composition here in Phitsanulok is very peculiar. Valuable materials have been picked/sort out from the MSW and what arrives at the landfill is mostly organic and low grade plastics. This type of composition of waste is ideal for producing Refused Derived Fuel (RDF). The cement company SCG has contact us and are interested in setting up a production facility beside the landfill site. The presence of Wongpanit in this region has changed to composition of our MSW." – *Phitsanulok Municipality Staff*

At the Phuket incinerator plant, I observed that sometimes there are local factors or variables outside of our expectations that affect the process. In case of the incineration process, the composition of organic waste on the incineration process can clearly be seen. From observation, when compared to Japanese cuisine, Thai cuisine is very liberal in the usage of oils for cooking and consumption. This oil remains in the MSW waste and begins to oxidize and polymerize as it decomposes. The polymerization forms a thin layer on the surface of the coated MSW that traps moisture and affects combustion, resulting in temperature fluctuations in the combustion process. The effect of local culture and traditions on MSW is one of reason for the low quality and difficulty in separating Thai MSW.

Interview and discussion with experts, local landfill operators, and workers at the 4 landfill sites revealed glaring problems in the operation of landfill sites.

- On the management level – Ever-increasing quantities of waste, Low prioritization on solving municipal solid waste issue (budget allocation), convoluted laws concerning the responsibility of waste disposal (disputes between local municipalities) are cited by the officials as some of the major issues in the operation of landfill sites.
- On the operation level – Lack of personnel, equipment, and financial support were cited by the workers at the local landfill sites as cause for poor management of the landfill sites.

To resolve these issues a large amount of capital is needed. Unfortunately with the current state of affairs, most of the individuals that I've discussed this with have stated that it is doubtful that the government will be able to completely revise the system. In the future, it is more likely that privatization of the MSW will occur.

(3) Achievements and its future vision (less than 400 words)

Considering my background in engineering, I tend to just look at data and make decisions based on them. This trip has proven me that not all knowledge can be found in data and that the validity of the data has to be considered. An important consideration is that several other factors cannot be represented by data. For example, it is difficult to describe human nature (love of convenience) using just data. An ideal economic decision might not be the most viable solution to the challenge. I have come to realize that it's not just important to compromise between economics and legal considerations, but also we need to compromise with society and nature.

When I graduate from my education, I plan to enter the industry before joining a government agency. Due to my communications skill and engineering background, I expect to function in the role of international coordinator or facilitator. As an assistant during this overseas field training trip, with the task of supporting the organization and communication, it was a valuable experience for me. The trip gave me the opportunity to form contacts and exchange ideas with experts and seniors in the environmental sectors. It has also helped broaden my perspective and mature my outlook toward environmental issues.

I remain convinced that the key is to increase society's participation and awareness to solving environmental problems. The core concept is that polluters should pay for their pollution. They should be responsible for majority of the costs that arise during waste treatment. Implementation of this concept would drastically alter the human behavior into a more conservative and environmentally friendly manner. This requires improved environmental education, participation and rewards campaigns, and revision of legal frame to help promote desirable behavior.

(4) Acknowledgement

I would like to express the deepest appreciation to the FOLENS program for providing me with the opportunity to participate and financial support in this overseas field training. I would like to thank all the FOLENS staff and their local counterparts for organizing and supervising this training. Again, thank you Professor Tiwa, Professor Pisit, Professor Tharapong, and Professor Pauzi.

I would also like to express my gratitude towards the various organizations and experts that were so willing to answer my questions and share their experience. In particular I would like to thank Associate Professor Kenichi YONEDA for his constant support and supervision during the trip.

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(Supervised by Kenichi YONEDA)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Study about Greenhouse gases emission from Phuket Sewage Treatment Plant in Thailand

TANG SI HIEP
Tokyo University of Agriculture and Technology
Department of International Environmental and Agriculture Science
Destination: Thailand, period: July 28th to August 10th, 2013.

Key words: Greenhouse Gas Emission, Domestic Sewage Treatment Plant, Waste Water Treatment Plant

Abstract

As FOLENS overseas field study, I visited various environment-related sites and learned the issues, solutions, measures and efforts in Thailand. After the group field study, I moved to Hanoi, Vietnam to visit my family and investigate the environment issue in my village. By participating in the Thailand oversea training, I have many good friends. They come from different countries (Thailand, Japan, China, Malaysia, Mongolia, and Cambodia) with profound knowledge about environment. This field trip also broadens my knowledge about the environment, the efficiency solutions and measures in Thailand (Incineration, Wastewater Treatment Plant, Landfill, Rice Paddy Field, Bio Fuel, Biodiesel Synthesis, and Recycling Plant). Another benefit of this trip is to improve my communication (in English and Thai language) skill, practicing skill in the field. Besides, I have learnt a lot about the culture, food, people, and history of Thailand. I also have been to several beautiful and famous places in Thailand. For my specific research, I take and analyze 6 gas samples to identify the concentration of CO_2 and CH_4 emission from Phuket Sewage Treatment Plant under the instruction of Professor Lek (from Kasetsart University). It took about 4 days for collecting the samples and 3 days for analysis. The results showed that CO_2 concentration was higher than CH_4 concentration, and the greenhouse gas concentration was different in different reactors (reactor 1 and reactor 3).

(1) Contents and activities during the overseas field training (less than 600 words)

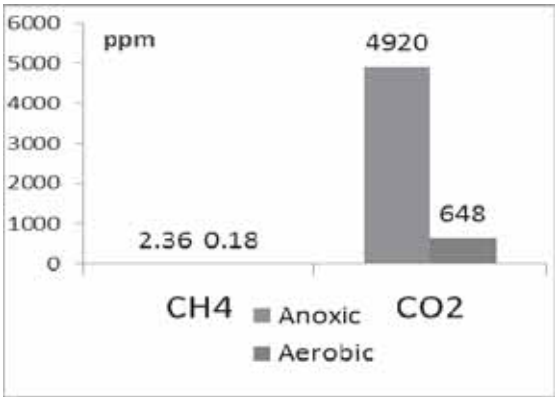
Thailand is the destination for my overseas training. I and my friends conducted our researches under the instruction of kindly professors from Thailand (Prof. Tiwa – Kasetsart University, Prof. Pisit Moneechot – School of Renewable Energy, Prof. Lek – Kasetsart University), Malaysia (Prof. Pauzzi), and Japan (Prof. |Yoneda, Prof. Ozaki, Prof. Ninomiya – Lim). Besides, we received warm welcome and help from the staffs

of Phuket Sewage Treatment Plant, Bio – Ethanol Plant, Bio – Diesel Plant, Hua – Hin Landfill, Kasetsart University, Phuket Municipal Solid Waste Incineration Plant, and Farmers at Rice Paddy Field. I greatly appreciated their help and instruction for my study. In this report, I would like to say thank you to all of them. As a result of group work, I also have a lot of good friends from Thailand, Japan, Cambodia, China, Mongolia, and Malaysia. They are gentle, active and trustful. My study has good achievements as a result of their help in group work.

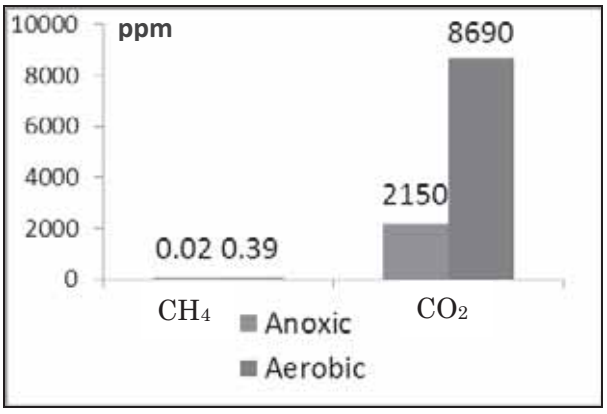
My study began from July 28th to August 22th. The subject title is "Study about greenhouse gases emission from Sewage Treatment Plant" (in Phuket, Thailand). I took 1 day for set up chambers, and 3 days for collecting greenhouse gases (6 samples). Then, CO_2 and CH_4 samples were analyzed in the laboratory in Thailand. This analysis took about 3 days for 6 samples. It was very lucky for me, the weather was so nice on that day I collected my sample. It was cool and windy. And the foods were very delicious. I ate a lot of spicy food. This helps me to be stronger and complete my overseas training with good data. After finishing my data collection, I had free time to help my friends to collect their sample. I had participate all of my friend activities, including the collection of water sample, incineration, laser measurement, biodiesel plant, landfill, bio – ethanol plant, and other social activities.

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

After conducting my field data collection and analysis, I found that greenhouse gases (CO_2 and CH_4) emission is different in anoxic and aerobic zone for both reactors 1 and 3 (The condition of reactor 1 and 3 are similar). Specifically, reactor 1 has higher CO_2 and CH_4 concentration in anoxic zone, while reactor 3 has higher CO_2 and CH_4 concentration in aerobic zone.



Gas concentration in Reactor 1



Gas concentration in Reactor 3

CO2 concentration is much higher than CH4 concentration in both reactors (1 and 3). This data will be basement for future research about greenhouse gases emission from Phuket sewage treatment plant. Besides, the field trip also broadens my knowledge about environment, community, culture, history, food, and beautiful places of Thailand. I gained a lot of skills in communication with local people. This improves my English and Thai language. Thai people like spicy food. Many restaurants sell food, fruit with a lot of chilies. After eating spicy food, I have drunk 1 liter of water to reduce hot (for the first time). Thai

Government constructs many sewage treatment plant, landfill, incineration to improve the quality of environment. However, the waste separation is difficult to implement for local people. It is difficult to change the habit of local people which follow them many generations. My Thai teacher has the method of changing the local residents' habits by using monks. Thai people believe and follow monks. In small area, monks can teach residents how to protect environment efficiently.

For me, the first lesson is "*running as soon as possible*" and the second lesson is "*Wear glasses to protect eyes when going out*".

(3) Achievements and its future vision (less than 400 words)

In the future, this overseas training provided me an experience about Thailand (environment, people, food, history, culture, and beautiful places) which helps me to efficiently deal with global environmental issues. Many environmental problems have relationship with human's impact. So, I need to understand the global environment as well as culture, history, culture of other countries (Thailand, Japan) for cooperation in improving international environmental problems (air, water, and biodiversity). My result of greenhouse gas in Sewage Treatment Plant will be a reference for future research to reduce the impact of Sewage Treatment Plant to global warming.

(4) Acknowledgement

I would like to say "thank you" to FOLENS program which organized the field trip for me and other my friends. FOLENS program has provided money and supported equipment for our group to conduct overseas field trip in Thailand. Besides, I greatly appreciate the helps, warmly welcome and enthusiastic of professors (Thailand and Japan), staffs, and farmers in Thailand. Specifically, Prof. Lek directly guides me how to set up, collect, and analyze greenhouse gas samples in Phuket Sewage Treatment Plant. He is a handsome and kindly professor. When I live in Thailand, I received a lot of warmly welcome of local resident. For me, Thailand is second home in my heart. Again, thank you very much.

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(Supervised by Prof. Yoneda, Prof. Lek, and Prof. Gomi)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Groundwater Quality Assessment and Its Suitability for Domestic and Agriculture Uses in Coastal Zone of Mekong Delta, Vietnam

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United Graduate School of Agriculture Science
Tokyo University of Agriculture and Technology
Destination and period: Vietnam, August & September, 2013

Key words: groundwater quality, domestic, irrigation, suitability, assessment

Abstract

The field training activities were conducted at College of The Environment and Natural Resources, CanTho University, CanTho city and Vinh Chau district, Soc Trang province. The study area is Vinh Chau, part of the SocTrang province, which is located; downstream part of Mekong Delta, coastal zone and borders to East Sea of Vietnam. In the area, the groundwater resources are developed for water supply and irrigation purposes. Through the discussions, samplings and laboratory works, hydro-chemical evaluation of groundwater was conducted. In order to evaluate the quality of groundwater in study area, 31 groundwater samples included 21 samples at domestic wells and 10 samples at irrigation wells, were measured on site and analyzed in laboratory for various parameters. As a result, groundwater chemistry was assessed for domestic and agriculture uses and by consideration of water quality index factors from World Health Organization and United States Salinity Laboratory. In addition, the investigation and sampling experiences were shared by lecturers and staffs from Cantho University and local government at study site and discussions. Due to coastal zones in Mekong Delta is facing climate change and natural disaster, which are increasingly serious, studies relevant to environment and water have been concerned by local government. The results of the field study will be contributed to annual environment report of VinhChau district and considered as the first step to develop studies of groundwater which is an important resource in the future.

(1) Contents and activities during the overseas field training

The Title of Overseas Field Training: "*Groundwater Quality Assessment and Its Suitability for Domestic and Agriculture Uses in Coastal Zone of Mekong Delta, Vietnam*"

+ Discussions and meetings

- Prof. Akira GOTO (Instructor, Utsunomya University) and Prof. Nguyen Hieu Trung (Dean of

Faculty of The Environment and Natural Resources, CanTho University) to define study zone and progress of field training;

- Mr. Nguyen Tien Tung, Mr. Pham Van Hung (Staff of Division for water resources planning and Investigation for South of Vietnam) to learn about investigation experiences in local scale;

- Dr. Ing. Nguyen Vo Chau Ngan (Department of Environmental Engineering, CanTho University) and to arrange instructions, instruments and chemical analysis in laboratory;

- Giving of introduction of field study method at College of The Environment & Natural Resources, CanTho University to get advices and to find supports of undergraduate and graduate students for the study;

- Informing of study activities and on field works to get supports from Master students (M1 & M2) of CanTho University (Mr Tran Trong Duy, Ms Nguyen Thi Thanh Duyen, Mr Nguyen Van Day and Ms Nguyen Thuy Duong);

- Local authorities (Mr Bui Nhu Y – Head of Environment Department of Vinh Chau district & Mr Nguyen Van Lam, Mr Nguyen Thao – staff of Environment Department of Vinh Chau district) to arrange and get their supports for the field training activities.

+ Investigation, measurement and sampling

- Interviewing at 31 local farms, households for pumping activities;
- Sampling equipments and chemistry preparation;
- Sensors calibration for MPTROLL-9500; on-site instrument; in CTU's laboratory;
- On field measurements and samplings at 31 irrigation and domestic wells;
- Samples analysis for groundwater chemistry at CTU's laboratory.

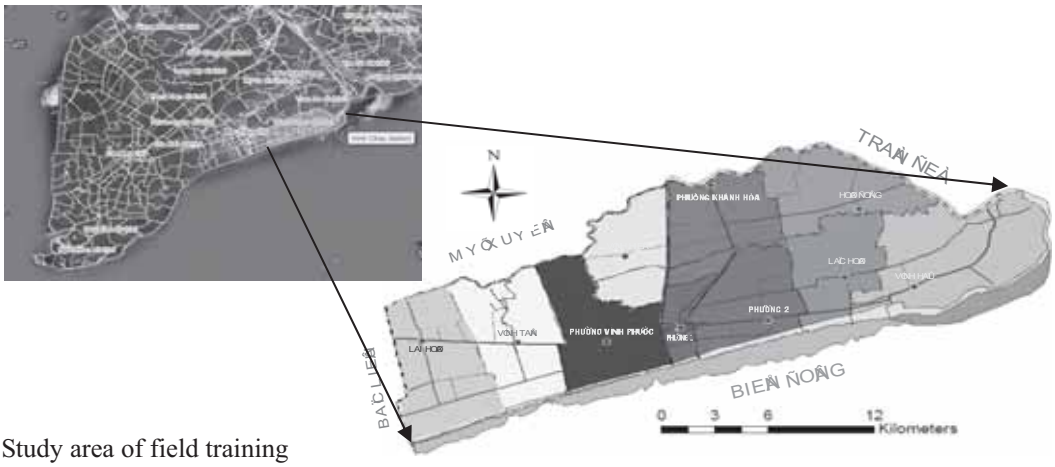

Figure 1 Study area of field training

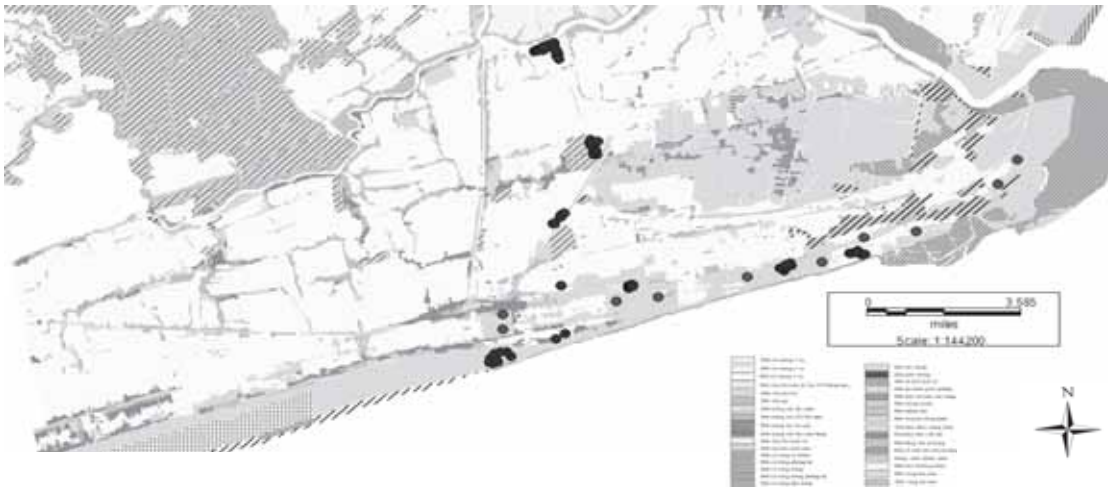

Figure 2 Interviewed & sampled locations at study area *(Blue dots: Domestic wells; Red dots: Irrigation wells)*

The study area locates in coastal zone; is a downstream part of Mekong Delta. Its land use is also mainly covered by agricultural production (Figure 1 **Study area of field training**, Figure 2 **Interviewed & sampled locations at study area *(Blue dots: Domestic wells; Red dots: Irrigation wells)***). At the present, the impacts of salinity intrusion on surface water resource and freshwater shortage are increasingly serious [1]. Therefore, groundwater has been accessed as a freshwater resource by human activities and productions [1,2]. In addition, the study area belongs to vulnerable zone of Mekong River basin by climate change impacts. Hence, groundwater resources, one of key factors for sustainable development, may be impacted by climate change [3]. Sea level rise can also cause salinity intrusion of groundwater [2]. Those issues have been recognized and concerned by local government and people through environmental education programs [1]. However, due to lack of results of practical studies on environment in general and groundwater field in particular, local government has embarrassed to reach strategy plans for natural resources protection and management [2].

(2) Findings and achievements obtained, significant experiences and lessons

Expected results and methods

Through the field training, *groundwater extraction rate* for irrigation and household uses were estimated by interviewed information. In addition, results of groundwater quality assessment as following:

- *Hydro-chemical facies:* The values obtained from the groundwater samples analyzing, and their plot on the Piper's diagrams [4] (Figure 3 Piper diagram is a graphical representation of chemistry of water samples) reveal that the dominant cation is Ca and the anion is HCO3. In the study area, the major groundwater type is Ca-HCO3 and Ca-Mg-HCO3. Chadha [5] has proposed new diagram for geochemical data presentations. The proposed diagram is a modification of Piper diagram with a view to extend its applicability in representing water analysis in the possible simplest way. Results of analyses will be plotted on the proposed diagram to test its applicability for geochemical classification of groundwater and to study hydro-chemical processes.

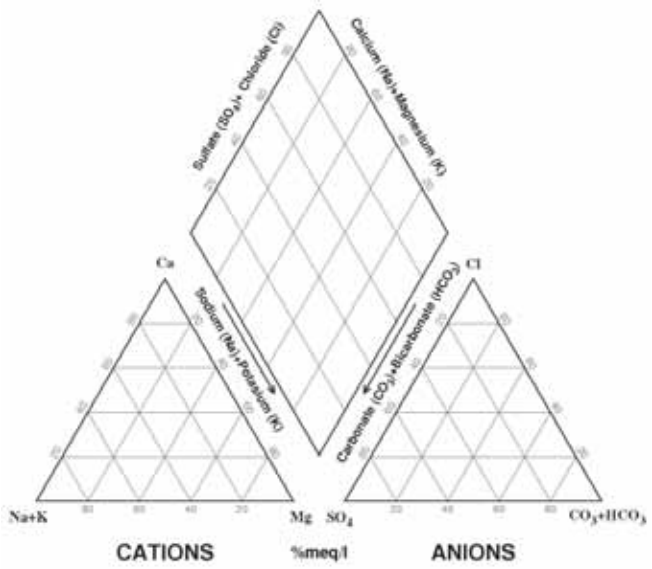

Figure 3 Piper diagram is a graphical representation of chemistry of water samples

- *Drinking water quality:* is evaluated by comparing with the specifications of TH and TDS set by the World Health Organization [6,7]. According to WHO specification TDS up to 500 mg/l is the highest desirable and up to 1500 mg/l is maximum permissible (Table **2. WHO international standard for drinking purposes (1971, 1983)**). Maximum allowable limit of TH for drinking is 500 mg/l and the most desirable limit is 100 mg/l as per the WHO international standard (Table 1. **Suitability of groundwater based on hardness**) Based on this classification, it indicates the groundwater quality are exceeded the maximum allowable limits or not.

Total hardness as $CaCO_3$(mg/l)	Water class
<75	Soft
75–150	Moderately hard
150–300	Hard
>300	Very hard

Table 1. Suitability of groundwater based on hardness

Parameters	WHO international standard	
	Most desirable limits	Maximum Allowable limits
PH	7–8.5	9.2
TDS(mg/l)	500	1500
TH(mg/l)	100	500
Na(mg/l)	-	200
Ca(mg/l)	75	200
Mg(mg/l)	50	150
Cl(mg/l)	200	600
SO_4(mg/l)	200	400
NO_3(mg/l)	45	-
NH_3(mg/l)	0.05	0.5
F(mg/l)	-	1.5
Fe(mg/l)	0.1	1

Table 2. WHO international standard for drinking purposes (1971, 1983)

- *Determining the suitability of groundwater for agricultural uses:* Salinity and indices such as, *SAR* (sodium adsorption ratio), Sodium percentage (Na%), *RSC* (residual sodium carbonate) are important parameters to evaluate groundwater for agriculture uses [8,9]. In addition, *EC* (electrical conductivity) is a good measure of salinity hazard to crop as it reflects the TDS in groundwater. The US Salinity Laboratory (USSL) [10] classified groundwater on the basis of electrical conductivity (Table 3). *SAR* (sodium adsorption

ratio) is also an important factor for determining the suitability of groundwater for irrigation because it is a measure of kali/sodium hazard to crops [11].

Quality of water	Electrical conductivity (S/cm)	Sodium adsorption ratio(SAR)
Excellent	<250	<10
Good	250–750	10–18
Doubtful	750–2250	18–26
Unsuitable	>2250	>26

Table 3. Classification of groundwater for irrigation based on EC, SAR (USSL)

Study and on-site leanings

- Study skills:

+ Investigation and interviewing methods in case of Vietnam;

+ Using of groundwater quality instruments and monitoring methods;

+ Taking of samples and pre-treatment methods on field;

+ Groundwater quality analysis methods in CanTho University's laboratory;

+ Data analysis and graphic skills in term of groundwater field.

- On-site feeling notes:

+ The farmers that have access to the fresh groundwater prefers dry periods rather than wet periods since the farmer has the possibility to control the growth of the product;

+ Not all farmers could use pumps to get fresh water out of the ground. This was because the lower located farmers deplete this resource. The high located farmers react on this by pumping water in the night (11 pm – 2 am);

+ Onion farmers get more revenue by growing in early season, but this is relatively insecure due to too much rainwater;

+ Drought causes dry soil, resulting in loss of crops;

+ Some rice does not have access to irrigated water, resulting in loss of crops, farmer grows rice crop in rain season and they do not care about benefit of rice production;

+ Farmers use wells in the centre of the acre for irrigation.

(3) Achievements and its future vision

As a discussion of local government staffs in Department of Environment at Vinh Chau district, Soc Trang province, the results of field study will be written as full text report and sent to them. The contents of report will be considered to contribute to annual environment report of Vinh Chau district. In addition, study results are not only helps the local government can realizes status of groundwater sources and potential issues but also useful for my PhD study which focuses on groundwater modeling development and application in coastal zone of Mekong Delta. Besides that, the field training provides study skills and practical experiences to me.

During the field training, I could recognize not only current issues but also potential issues that groundwater resources are facing in coastal area of Mekong Delta, Vietnam. To solve and adapt those problems, a local management plan of water resources will be required and based on field studies. Therefore, skills of field study, data analysis and investigation are quite important to obtain reality results basically. By the results and recommendations, next decision planning will be reached by local government.

(4) Acknowledgement

This field training would not have been possible without the support of FOLENS program and many people. I wish to express my gratitude to my supervisors, Prof. Akira GOTO and Prof. Nguyen Hieu Trung who was abundantly helpful and offered invaluable assistance, support and guidance. Deepest gratitude is also due to director of FOLENS, Prof. Hideshige TAKADA and the lecturers and staffs of the FOLENS program, Assist. Prof. Dr. Hirokazu OZAKI, Assoc. Prof. Dr. Ninomiya-Lim SACHI and Ms. Sugiyama CHIEKO and Ms. Aki TAYA without whose guidance and help this field training would not have been successful. Special thanks also to CTU's lecturers and master students, especially Dr. Ing. Nguyen Vo Chau Ngan for sharing lectures in study site and invaluable experiences in laboratory. Not forgetting to staffs of Environmental Department of Vinh Chau, Mr. Bui Nhu Y, Mr. Nguyen Van Lam, Mr. Nguyen Thao who always been at study site to share knowledge. I would also like to convey thanks to Mr. Nguyen Tien Tung, Mr. Pham Van Hung, staffs of Division for water resources planning and Investigation for South of Vietnam for providing investigation experiences in local scale. I wish to express my gratitude to local farmers; for their helping and information, through the duration of the field study.

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(Supervised by Professor Akira GOTO)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Development of Handwritten Thai Language Recognition System for Paperless Society

Tomohisa Matsushita
2nd Year PhD Course Student, Department of Electronic and Information Engineering,
Faculty of Engineering, Tokyo University of Agriculture and Technology
Destination and period: 4, Aug. – 16, Aug., 2013

Key words: paper waste, paper consumption, electronic paper, tablet,
digital pen, handwritten character recognition

Abstract

Paper consumption makes large environmental impacts. On other hand, electronic devices like paper are available. In the near future, these devices may become more thin and need less power. Then, they will be accepted by people as electronic paper. The one of good feature of electronic paper is reusable. If we can use electronic paper instead of traditional paper, we may be able to reduce environmental impacts caused by paper consumption. In this field training, I studied about environmental impacts related paper consumption in Thailand by observation of the real situation. Also, I collected handwritten data in Thai language and opinions about paper consumption.

When we use electronic paper, it is not satisfied only by devices. Suitable software and infrastructure are necessary. And also, they have to be integrated by optimized design. The opinions of this investigation will help the concept design of the system. And also, the collected data will help the research of software, particularly part of handwritten character recognition. I strongly expect that useful electronic paper system will be put into practical use and traditional paper consumption will be reduced and these results will contribute the paperless society.

(1) Contents and activities during the overseas field training

Title of this training is “Development of Handwritten Thai Language recognition System for Paperless Society”. My supervisor is Prof. Masaki Nakagawa and training coordinator is Prof. Kenichi Yoneda. This training had conducted from 4, Aug. to 16, Aug., 2013 in Thailand. The purposes of this training are observation of the real situation of paper waste in Thailand and collecting opinions and handwritten data for the research on the paperless society.

Environmental Issues

Generally, it is said that paper consumption makes large environmental impact. The situation of Thailand is reported by Pariatamby et al. According to the report, the amount of municipal solid waste is increasing year by year. However, sanitary disposed waste is less than half. For example, the paper waste occupies 8% whole the country in 2004 (**Fig. 1**). Also, the paper waste occupies 11% in Bangkok in 2008 (**Fig. 2**). In addition, paper production may lead deforestation. Paper production and paper recycling also require much water and fuel. (e.g. De-inking phase)

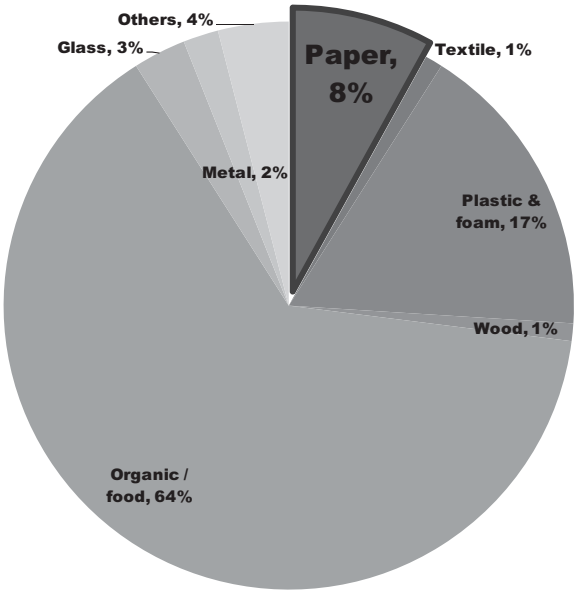

Fig. 1 Composition of municipal solid waste collected throughout the whole country
Source: Adapted from data of the Pollution Control Department (2004)

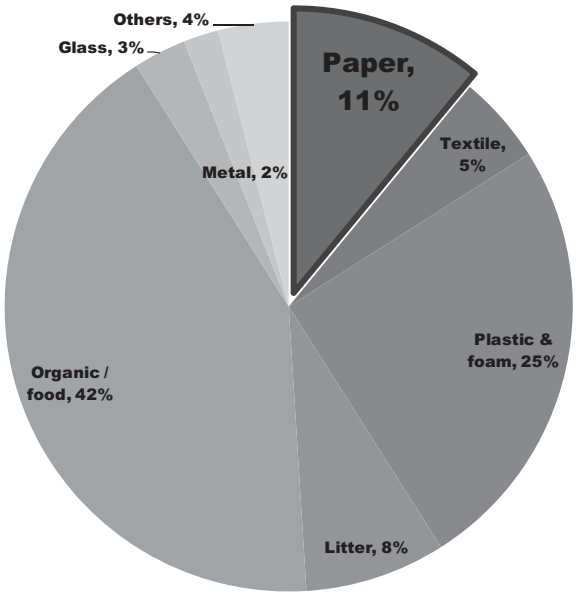

Fig. 2 Composition of municipal solid waste collected in Bangkok in 2008.
Source: The pie chart was prepared based on data from the Strategy and Evaluation Department, BMA (2009)

Training Contents

Observation of the real situation:

In Japan, most of waste is burned by incinerators. However in Thailand, most of waste goes to the landfills. In this training, we visit some landfills and observe the state of the paper waste. In fact, we visited 2 landfills as follows:

- Phitsanulok at 8, Aug., 2013.
- Ayutthaya at 13, Aug., 2013.

Collection opinions and handwritten data:

In both of Japan and Thailand, we may use electronic paper in the future. In this training, we confirm their needs by collecting their opinions. And also, we collect handwritten data for the research on handwritten character recognition. In fact, similar data collecting had already been conducted in Japan and the U.S. Therefore, we utilize the knowhow for this training. We visited mainly 3 places as follows:

- Kasetsart Univ. in Bangkok at 6, Aug., 2013.
- Naresuan Univ. in Phitsanulok at 8, Aug., 2013.
- Regional Environmental Office 8 in Ratchaburi at 14, Aug. – 15, Aug., 2013.

There faculties, staffs and students participated this activity and total 49 people gave cooperate.

(2) Findings and achievements obtained, significant experiences and lessons

The users are indispensable for every system. Therefore, research and development of software must be conducted with the users. The following experience practical to my doctor course study as a field-oriented leader in environmental sectors in Asia and Africa.

Good points:

In this training, most people gave cooperate us aggressively. Probably, I think that these points affected.

- Most important point is their honesty and kindness.
- Additionally, in this training, we could visit the local area and we could talk with the local people face to face. Therefore, we could show our motivation easily. They might understand it and good effect might appear. When it is possible, we should go their places and talk directly.

Suggestion:

- My preparation had been quite late. It made inconvenience to many other people. Preparation should be conducted in a planned manner and as early as possible.
- Also, they have convention and it is different from ours in some cases. We should understand it and we should follow it. Hierarchical relationship in Thailand is more serious than Japan. Therefore, we have to get permission of top leader of target organization.

(3) Achievements and its future vision

In this training, these achievements have been gotten.

The real situation of the paper waste in landfills:

Most contents of waste were plastics. However, paper waste was certainly included. (**Fig. 3**, **Fig. 4**)

Problem consciousness, needs and opinions of local people (Potential user):

Approximately 3/4 participants think that they are using too much paper (**Fig. 5**), and they want to use electronic paper instead of traditional paper (**Fig. 6**), and they consider the environmental impacts related paper consumption in Thailand (**Fig. 7**). In fact, each question was answered with reasons. However, they are written in Thai language. Therefore, we will translate and aggregate them.

Fig. 3 The real situation of Phitsanulok landfill site at 8, Aug., 2013. (1065, Tambon Bueng Kok, Chang Wat Phitsanulok 65140, Thailand)

Fig. 4 The real situation of Ayutthaya landfill site at 13, Aug., 2013. (Soi Mu Ban Khit Thueng, Tambon Ban Pom, Chang Wat Phra Nakhon Si Ayutthaya 13000, Thailand)

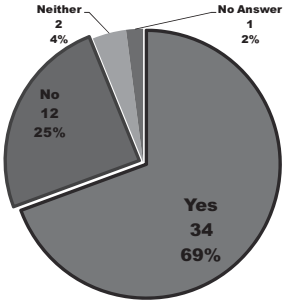

Fig. 5 Q1. Do you feel that you use too much paper every day?

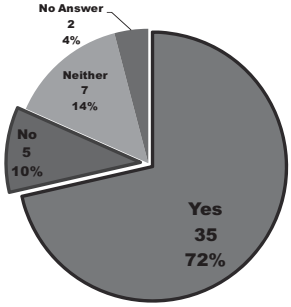

Fig. 6 Q3. If there are some electronic devices instead of paper, would you use?

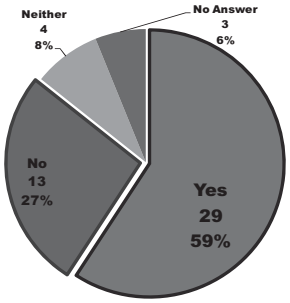

Fig. 7 Q4. Do you think that the waste paper will become one of important problems in Thailand in the future?

Raw handwritten data as research platform:

Each participant wrote 10 pages including questionnaire page (**Fig. 8**). These writing data will help not only my research but also community of the research.

In the future, I hope to make paperless devices practical use. Also, I will contribute paperless devices eco-products to the local and urban people in Thailand.

(4) Acknowledgement

I would like to great thank to FOLENS, Prof. Kenichi Yoneda and faculties for opportunity. Also, I would like to great thank to Prof. Tiwa Pakoktom (Kasetsart Univ.), Dr. Pisit Maneechot (Naresuan Univ.), Regional Environmental Office 8 staffs and all participants.

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(Supervised by Associate Prof. Kenichi Yoneda and Prof. Masaki Nakagawa)

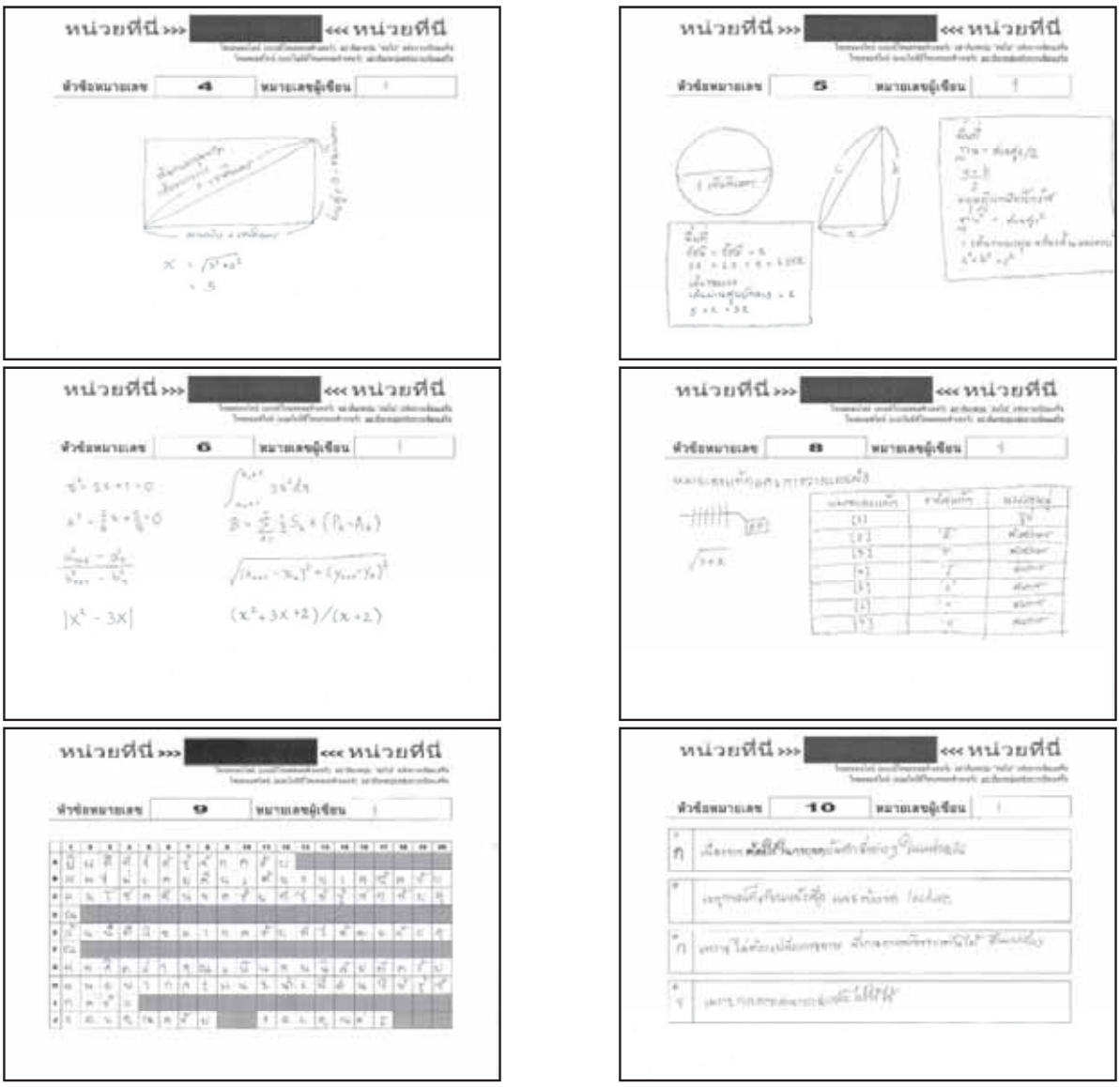

Fig. 8 Sample of collected data

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Overseas Field Training in Russia: Screening of Caucasian Plants for Allelopathic Activity

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Destination and period: Russia, Caucuses. 4/August/2013 - 28/August/2013

Key words: Allelopathy, Caucuses Mountains, Russia, vegetation

Summery

The Caucasus region is identified as one of the 25 biologically richest and also most endangered terrestrial ecoregions of the World (Zazanashvili et al. 2000; Myers et al. 2000). Therefore, to practice my field training, I visited Russia for a period of 25 days started on 4th of August. This travel was supported by Education program field-oriented leaders in environmental sector in Asia and Africa (FOLENS). The objective of my travel was collecting and screening the Caucasian plant to understand their potential for allelopathic activity. It should be noted that finding new natural chemicals from plants, we will be able to apply them to produce new ways to control pests, weeds etc to reduce agrochemicals in the world. During this trip, I also moved to Teberda town in the south part of Russia to visit the Teberda State Natural Biospherical Reserve and have observation about Caucuses Mountains and its unique vegetation. Moreover, I visited Moscow State University Botanical Garden and Biological station in Zvenigorod Town to learn more about the Russian plants and ecological issues. Luckily, more than 170 plants were collected and moved to Japan for the future studies.

Background

Geographically speaking, the Caucasus region covers an area of 500,000 km2 in Armenia, Azerbaijan and Georgia, the North Caucasian portion of the Russian Federation, NE Turkey, and a small part of NW Iran (43° 21′ 18″ N, 42° 26′ 31″ E) (Fig.1). The flora and vegetation of the Caucasus are very diverse, and they depend on both the physical features discussed below and the evolutionary history of the ecosystems. Basically, typological diversity of vegetation zonation on the mountains of the Caucasus is defined by (1) the geographic transitional position of the region between temperate deciduous broad-leaved forests and subtropical latitudinal zones; (2) the location of different phytogeographical provinces (Mediterranean, Minor Asian, Iranian) in the contact area; (3) vegetation the evolutionary history of the Caucasian native flora (during the ice ages there

were two refugia of the Tertiary flora in the region) (Zazanashvili et al, 2010). Basically, there are four types of vegetation zonation on the Caucasus Mountains: West Caucasian (Colchic), East Caucasian, South Caucasian (Front Asian) and Southeast Caucasian (Hyrkanic).

On the other hand, only a few botanical investigations have been done, especially screening of allelopathic-active species and interrelationship among the plants in Caucasus. Therefore, I decided to visit this area to collect some plants for screening of their allelopathic activities.

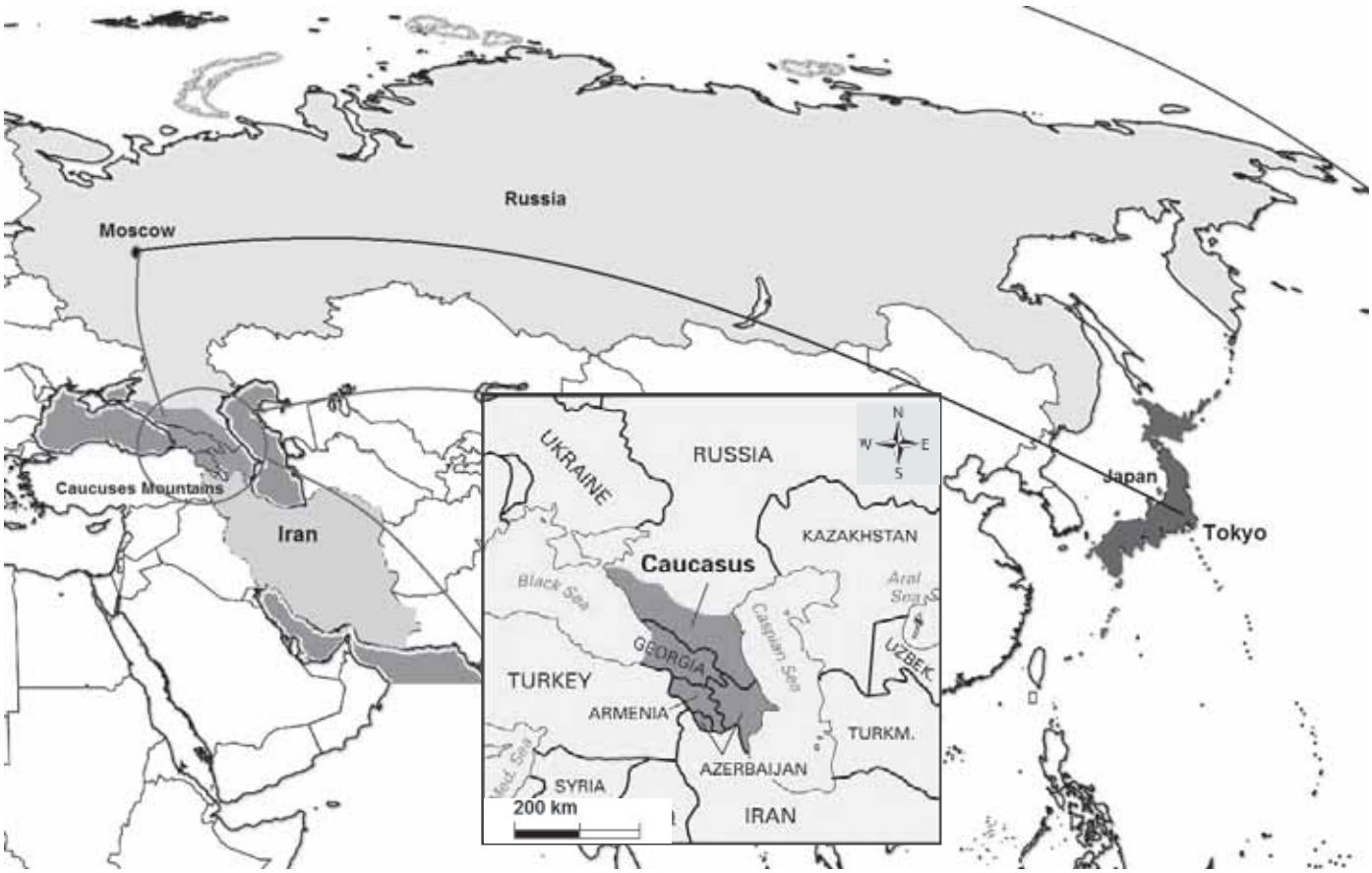

Fig.1. Location of Caucuses Mountains in the world and direction of my field training from Tokyo to Teberda (Caucuses Mountains)
Location: 43° 21′ 18″ N, 42° 26′ 31″ E

Contents and activities during the overseas field training in Russia and Caucuses

My activities in Russia started in Moscow. At first I visited Moscow State University (MSU) to meet professors and young scientists so as to negotiate about my plan in Russia and Caucuses. The activities included preparation for Fujii sensei presentation in MSU, advertisement and notification of the presentation, making poster and preparing the place at MSU, consulting with the Russian teachers and student about their achievements and future plans. Finally, on August 13th Fujii sensei gave a lecture about screening of Alelopathic plant in Asia and Africa (Fig. 2). As a result, many Russian scientists welcomed professor Fujii. The activities mentioned above can be found in the links blow:

http://www.bio.msu.ru/news/view.php?ID=754
http://www.bio.msu.ru/news/view.php?ID=752

Fig 2. Fujii sensei's presentation in Moscow State University

During the next days, in Moscow I also visited Biological station with Mrs. Elena Kazantseva (PhD student of MSU) in Zvenigorod Town in Moscow region. During some of the walking to the station, I managed to collect some plant samples for my research by staying a few hours longer at the forest and looking for them with the help from Mrs. Elena Kazantseva. The mentioned samples were including different part of Caucasians plant including leaves, seeds and fruits. Having a look around the biological station, I could see the Russia vegetation in the marsh around the Moscow and collect some specific plant spices.

Experiences in Teberda State Natural Biospherical Reserve

After passing a few days in Moscow, I and Fujii sensei, moved to the Teberda State Natural Biospherical Reserve in the south part of Russia to explore the Caucuses Mountains and collect the plants for the screening purposes. The general area of the Teberda reserve is equal to113064 hectares and is formed of two cluster sections consisted of Teberda (65792 ha) and Arkhyz (19272 ha) plus biospherical testing area (28000 ha). The Teberda part is situated on northern slopes of the main Caucasian mountain ridge overhead of the Teberda valley. Generally warm and damp climate of this is region in the main valley is rather changeable on different heights. On the other hand, the average summer temperature in Teberda is +15°C, while the winter one is -2°C. Thus, the region of the reserve represents itself as atypical mountain highland with highest range from 1260 to 4047 meters above sea level. This condition has provided a good habitat for plant and animal spices, therefore more than 6500 plant species growing in this area. Geographically speaking, this area is divided to subalpine and alpine area and diversity differs among this to regions. The main reason of this diversity is as a result of differences in attitudes, amount of rainfall and temperature in these two regions (Fig. 6). The subalpine area is located around 2,000 metres above sea level which is covered by beech, oak, maple, hornbeam, ash and coniferous forests. Interestingly, this kind of vegetation is usually found in the north-west part of Iran near the Caspian sea, which can show the similarities in vegetation between this area and my country (Iran).The alpine zone replaces the forest around 2,000 metres

above sea level (located between 2,800-3,000 m) where we could see the alpine vegetation which is commonly find in the north part of Iran.

In Teberda town, we consulted with Dr. Onipchenku who is a professor of the MSU and has studied the Caucuses vegetation more than 30 years in Teberda State Natural Biospherical Reserve. Therefore, I was able to learn about the vegetation of this area by the help of the local scientists. It was also great to participate in Prof. Onipchenku research activities such as: collecting plant samples for his researches, understanding the plant-plant interaction in small plant communities and new research about the Caucasian plants. One of the new achievements of Mr. Onipchenku was exploring a new species *Corydalis conorhiza* which is called snow-root plant. During the winter, this plant can develop its roots among the snow and uptake the nutrients. Having storage part, plant can use the nutrients during the next sessions. This phenomenon highly fascinated me. Moreover, it was a great chance for me to learn more about the vegetation of this part of the world.

There in Teberda, we also participated in Fujii sensei presentation which we had organized before for the Teberda State Natural Biospherical Reserve. As I believe that "communication is the key" I also consulted with the Russian scientists about our aims and our future plans in Caucuses region and asked them for more cooperation.

Farther, after a few days in at the Teberda student station, I moved to the main camp, located in the 3000 meters above the sea level (Alpine region). There I should live in the tent-camping sight with the other students. Thankfully, it was a great experience for me. Activates in the main camp was more based on the plant ecology including: plant life surveys, plant diversity and communities. One of the best experiences I had was the privilege of working with the Russian student in the camp. We discussed about their life and their experiences in reserve area. During our conversation we discussed about plant ecology and interaction between plants in alpine area, the students were investigating for their thesis, and how they study the plants in the area. During our conversation we discussed about the student thesis and how they study the plants. For example: how plant can influence their growth in small communities in alpine area? Or have diversity changes during a long period of years? Moreover, in some cases students had just focused on heavy metal accumulation in plant tissues in alpine and sub-alpine regions. To understand the concepts of these targets I managed to participate in their daily activates. This truly inspired me and I gladly offered to consult with them them for any technical questions regarding the environment to the best of my ability. They have also offered to keep in touch with us to share our idea and finding about environmental aspect in the future. During these days, I also participated in practical lectures by Prof. Onipchenku and help them in their research. These activates provided me a good knowledge about the plant life in the reserve area. Staying 5 days in the camp site, I collected more than 170 species, which majorities of them were domestic spices (Fig 4 and 5). I took the samples from the alpine area to the Teberda student station in Teberda town and dried them up with a drying machine for the screening stage. Moreover, using sandwich method, I screened some of the collected plant for allelopathi activity. Fortunately, I found 5 plant candidates which seem to have efficient inhibitory effect in early stage of germination of test plant (*Lactuca sativa*). However, because of lack of time, I brought the other samples to Japan and continue the screening.

Fig. 3 Teberda State Natural Biospherical Reserve Looking for alpine plant species (2800m)

Fig. 4 Russian researchers in Teberda State Natural Biospherical Reserve

Fig.6 Alpine (left) and sub-alpine (right) regions vegetation landscape in Caucuses

Findings and achievements

I believe this trip provided me a great chance to visit the Caucuses Mountain and study its plant vegetation. Regarding my master thesis which entitled "Allelopathy of some Iranian medicinal plants, Caucuses" provided me great opportunity to compare the plant diversity and their characteristic with Iran vegetation. Moreover, as far as I am studding in Japan, I would like to use this knowledge to study on the Japanese domestic plants. I think the diversity in Caucuses can provide a good recourse for future studies in allelopathic science. Using the achievements of this program in the future, we can apply in the agricultural inputs to have a better agriculture in the future.

On the other hand one of the main achievements of this travel will be the new cooperation between Moscow state university and TUAT.

Fig.7 Collecting plants samples during the way back to Teberda

Achievements and its future vision

To sum it up, this training has provided me a great opportunity to work with different scientist of different age groups and backgrounds. It has boosted my confidence in communicating environmental facts as well. Travelling to new cultures and interacting with strangers teaches one as much about oneself as it does about other people, nature and new aspect of science. Also, such kind of programs can open a new window to new cooperation between the young scientists. Lastly, I would like to pursue such action as an extracurricular activity if I go back to my country after my thesis program is directly related to the environmental issues. Having some experiences in Russia and since I still hold a dream of teaching in the future, carrying out the above activity especially with the help of my colleague teachers is likely to be successful. I dream to apply experience from my overseas filed training in my future life to be an excellent environmental leader in my country.

Acknowledgement

Firstly, I would like to thank Mrs. Elena Kazantseva for all her kindnesses and support during this program. I am thankful to Fujii sensei and Ozaki sensei for all their kindness and all they thought me during this program. Also, I would like to thank FOLENS for financial support of this project. Thanks to the, FOLENS staff, Teberda State Natural Biospherical Reserve's staff, especially professor Veladmir Onipchenko for all they did for me.

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(Supervised Yoshiharu FUJII)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Studies for the source of infection of *Salmonella* in Thailand

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Destination and period: Thai, August 5th -August 19th, 2013

Key words: Thai, gecko, *Salmonella*

Abstract

Recently, *Salmonella* Weltevreden infections are increasing in Southeast Asia. The host of *S.* Weltevreden hasn't been identified yet, but our laboratory already clarified wild gecko in Vietnam and Cambodia harbored *S.* Weltevreden at high rate and seemed to be the host of *S.* Weltevreden. To find out the danger of gecko as the cause of human *Salmonella* infection in other area of Southeast Asia, I researched about the prevalence of *Salmonella* in wild gecko in Thailand, from August 5th -August 19th, 2013. These results indicated that not only in Vietnam and Cambodia but also in Thailand, gecko harbored S. Weltevreden at high rate and can be the cause of human *Salmonella* infection, especially *S.* Weltevreden. Moreover, in all Southeast Asian countries, gecko seems to be the causes of human *Salmonella* infection and the host of *S.* Weltevreden.

(1) Contents and activities during the overseas field training

The title of my Overseas Field Training is "Studies for the source of infection of Salmonella in Thailand". I went to Thailand from August 5th -August 19th, 2013. Dr. Tiwa Pakoktom was my counterpart and Dr. Hideki Hayashidani was my supervisor.

Salmonella is one of the important foodborne human pathogens in the world. Recently, *Salmonella* Weltevreden infections are increasing in Southeast Asia. I thought the change of food production leads to increase human *S.* Weltevreden infection. In the past, people did small size farming and consumed foods locally. However, recently big farms and food factories are increasing, and a large quantity of food is produced at one site. And, by the development of transportation, food can be transported widely. This infection is a problem not only in Southeast Asia but also in Japan, because Japan imports foods which were produced in big farm or food factories. To prevent food contamination of *S.* Weltevreden, big farms and food factories need to take hygiene measures, but the host of *S.* Weltevreden hasn't been identified yet.

Our laboratory already studied about *S.* Weltevreden in Vietnam and Cambodia, and we clarified wild

gecko in Vietnam and Cambodia harbored *S.* Weltevreden at high rate and seemed to be the host of *S.* Weltevreden. In Southeast Asia, many geckos live around human, and I expected that this phenomenon is also observed in other Southeast Asian countries. Therefore, to elucidate a potential risk by gecko as the cause of human's *Salmonella* infection in other area of Southeast Asia, I researched about the prevalence of *Salmonella* in wild gecko in Thailand.

I visited Phitsanulok, Phuket and Nakhon Pathom and in each site, I collected 261 geckos in total with help of local people. I dissected geckos, took their intestinal contents and isolated *Salmonella* from them. After that, these isolates were identified their biovars and O antigens.

Salmonella was isolated from 120 of 261 wild geckos (46.0%) in Thailand. In Vietnam, *Salmonella* was isolated from many various species of animal, for example 7.9% of chickens, 5.2% of pigs and 23.8% of wild geckos harbored *Salmonella*. As compared with the prevalence of *Salmonella* in them in Vietnam, the prevalence of *Salmonella* in wild geckos in Thailand is at high rate. The predominant biovar of *Salmonella* isolates was biovar I, and the predominant O antigen was O3, 10. *S.* Weltevreden was included biovar I and possesses O3, 10 antigen. Therefore *S.* Weltevreden can be the most predominant serovar in *Salmonella* isolates of wild geckos in Thailand.

These results clarified that gecko harbored S. Weltevreden at high rate and can be the cause of human *Salmonella* infection, especially *S.* Weltevreden in Thailand, not only in Vietnam and Cambodia. These results are similar to results in Vietnam and Cambodia. Therefore in all Southeast Asian countries, gecko seems to be the causes of human Salmonella infection and the host of S. Weltevreden

Wild gecko in hotel in Thailand

Collecting intestinal contents from wild geckos inThailand

(2) Findings and achievements obtained, significant experiences and lessons

In this overseas field training, I couldn't collect so many geckos in Phitsanulok and Phuket. In Phitsanulok, we could find many geckos at night, for example they attached outside and inside of the hotel walls where I stayed. However they move very quickly, it was difficult for me to catch them. Phuket is a resort area, and it is bright at night and many people walk around outside till late at night. Local people said that geckos can be seen in their house, and I could see fewer them outside than Phitsanulok. On the other hands, I could collect a lot of geckos in Nakhon Pathom because Dr Tiwa helped me. From these experiences, I reaffirmed the importance of collecting advanced information and help of the local people.

Moreover, I understand the importance of field-oriented study. I could know not only the difference of Thailand and Japan, but also the difference among local places in Thailand. In this study, I didn't compared results of 3 places because I couldn't collect many samples in Phitsamulok and Phuket. However, I should compare them.

(3) Achievements and its future vision

I will start a job as a veterinarian in a local government from the coming April. I will work in human hygiene field, therefore it is good for me to visit some places in Thailand and see Thai foods and human hygiene condition. I can understand the importance of field-oriented study through this training, therefore I'll work not to forget the experience, and want to work for local people and local environment.

I will be a local public officer, and maybe I have few international work. However, if I have a chance,

I certainly will catch it and use the experience in this overseas field training.

(4) Acknowledgement

My heartfelt appreciation goes to Dr. Hideki Hayashidani whose enormous support and insightful comments were invaluable during the course of my study. I would also like to thank Dr. Tiwa Pakoktom and local people in Thailand who provided great cooperation and sincere encouragement.

(Supervised by Hideki Hayashidani)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Forest wildlife conservation: terrestrial mammals biodiversity preservation and mathematical challenges

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Destination and period: United Kingdom, Queen's University Belfast and University of Oxford,
11-24th August 2013

Key words: Wildlife, mammals, biodiversity

Description of counterparts and undertaking activities during training

Two weeks long Overseas Field Training titled "Forest wildlife conservation: terrestrial mammals biodiversity preservation" was held in two counterparts' sides. During first week of training I have attended various talks at Mammalogical congress held by Mammalogical Society in Queen's University Belfast and participated in various discussions with wildlife researchers from countries all over the world. At the second week training was done in Wildlife Conservation Research Unit (WildCRU), University of Oxford Zoology department. Where I have participated in WildCRU and Carneco joint mini-symposium, field training in Wytham woods was done and post filed trip lecture given by WildCRU researchers.

Training at Mammalogical congress in Queen's University Belfast (August 12-16th). During attending various talks at congress, communication and exchange with Wildlife researchers from European and Asian countries, I could learn about most recent wildlife issues and researches topics at different countries and current EU biodiversity preservation strategy. In particular "Exploring population dynamics in community and landscape contexts", "Small carnivores in space and time" and "Mammals adaptation on human-dominated landscapes" sessions were attended, where issues concerning population dynamics depend on climate condition, human activities, natural disaster (forest fires) were presented and discussed at first session. Throughout second session small carnivores' conservation, interruption with human being, landscape and species interaction etc. topics were learned. In the third session quite important issues about urban "wild" animals, its populations, movement, interaction with human, surviving and adaptation to live in urban areas vs. live in natural conditions were discussed. Overall during this various talks have covered

wildlife issues in South and North America (USA, Brazil etc.), Europe (Germany, Sweden, France, Finland, Italy, Spain, UK, Russia, Czech Republic etc.), Asia (Japan, China), Australia and others. Besides studying about current situation in wildlife conservation field and recent approaches for creating sustainable ecosystems in different countries another quite important point for me was learning about mathematical methods applied in this field. Throughout talks I could learn techniques and methodology of accessing spatial and temporal distribution of wild animals, and learn significant points for analysis of population dynamics, such as landscape condition, weather fluctuation etc., how it can affect population density and migration of observed species and how this affect can be properly analyzed. As a person with applied mathematics background I have found this information as the most essential and useful for my future work. I think that learned techniques might give new inspiration into my current research, as well. My PhD topic is application of Nonlinear Time Series Analyses to real world data (at current point of time on example of human photoplehysmograph), so basically it means considering dynamics only in the time frame, however it's obvious that most of real-world processes occur and exist in spatiotemporal space. Since wild life studying is defiantly deals with complex multi-dimensional systems, where loads of factors to be considered, in this sense there is certain similarity between systems that are object of wild life research and any other complex system. I think that adopting spatial analysis methods similar to ones used by wild life researches to my PhD project can be start for new approach of creating more reliable and full analysis of data I have been using or might use in my future wok.

Training at WildCRU, University of Oxford's Department of Zoology (Aug. 17-24th). Training at WildCRU consisted of, WildCRU and Carneco joint mini-symposium at Tubney house (residence of WildCRU), where worldwide wildlife conservation problems and related to it activity that is object of WildCRU research were discussed and studied and field trip in Wytham woods, where we could participate in actual field work on research of badger population in Wytham woods. After wield work it participants have attended post field trip lecture.

During mini-symposium (Fig.1, 2) participants have shared ideas, methods and purposes of their research among which various quite important issues from countries all around the world. This mini-symposium gave me an opportunity to know more about such significant topics as highly endangered Amur tiger population studying, research about African elephant population dynamics and migration. Another important subject of mini-symposium discussions was interaction between wild life and human and how it affects on it. Also participants have discussed techniques used in their researches, such as GPS and GIS approaches for monitoring of population, migration of different species.

Fig. 1 – during joint mini-symposium

Fig. 2 – joint mini-symposium participants in front of Tubney house

Field practice with WildCRU researches was held in Wytham Woods that are an area of ancient semi-natural woodland to the west of Oxford, UK, owned by the University of Oxford and used for environmental research. Wytham Woods contain a variety of habitats including ancient semi-natural woodland, secondary woodland and plantations as well as calcareous grasslands, a valley side mire, an arable weed plot and a variety of ponds. Wytham Woods are one of the most researched areas of woodland in the world. Wytham has a wealth of long term biological data, with bird data dating back for over sixty years, badger data for over thirty years and climate change data for the last eighteen years

During Wytham wood field trip we could participate in badger researchers' everyday work that mainly consisted of three following parts. First part was collection of wild badgers that was caught by trap attracted by the peanuts bait. Second part was body condition check and measurements that included various aspects. Each badger was assigned with the number and all data were carefully fixed for that unique identification number. And finally, last part was realizing badgers back to forest and preparing new traps, by putting cages in Wytham woods at places where badger's groups were detected by cameras installed on trees and filling those cages with peanuts. This field trip has opened for me new side of research work. So far all my research activity has been connected with data analyzing or simulation, but all the real data despite of

Fig. 3 – During Wytham wood field trip with badger researchers

their nature I have been considered as some sort of an abstract data that are series of numbers rather than anything else. This type of abstract interpretation of data is conventional for mathematics major students and usually deeply in their mind, it definitely gives advantage for pure mathematical analyses but keeps us far from understanding underlying real processes and its dependence on surrounding environment. But throughout this field work I have opened for myself that actually real word data are “alive”. Everything that was shown by badger researches during mammological congress and mini-symposium turned out to be in real living shape. I think this experience give me hint for my own research where I use data obtained from human being. I realized that there is no way to understand what type of data we have, to interpret phenomenon that appeared in it without close look on system/organism, which produced it and considering its natural dynamics. Only when data become “alive” we can discover it in all the complexity that Nature inbuilt in it.

After finishing Wytham wood field trip we could learn from post trip lecture about badger social behavior and life conditions that are essential for understanding what we could see during field trip. Badger researchers have introduced to us results of their studying of badgers social life obtained during several years of research.

Lessons learned during overseas training and how it can be used for future work

I find that this trip gave my opportunity not only learn about most important wildlife biodiversity issues in general and biodiversity conservation in forest on example of badger’s research. But what is the most important for me, it gave me vision of how I can use mathematical and GIS methods, that are essential part of my educational background, for contributing to wildlife studying. What I have found that methods used by the researches to analyze population dynamics, migration, species food dynamics etc. are mostly quite simple and linear, though real word processes and therefore data are rarely linear and in most of cases shows complex nonlinear behavior that arises from various interactions within system itself and between different systems, as well. Linear methods are mostly toy models that hardly can satisfy real world phenomenon. Throughout 2 weeks I could find that most of methods used by wild life researchers for

studying of temporal dynamics of time series were limited to simple usage of linear regression and liner approximation/interpolation/ extrapolation, that are most basic and simple techniques lying in the bottom in hierarchy of mathematical methods that might be applied to time series. This simplification from my point of view appears as a result of lack of mathematical background of wildlife researchers. However , on the other hand as a rule mathematicians are mostly not familiar with real behavior, habits and other aspects of wild animals (which are clear for wild life scientists) so they are not able to use their highly developed mathematical toolkit for creating realistic models of, for example, population dynamics of forest wild animals. As my PhD project connected with nonlinear time series analyses, I believe that methods I'm using in my research would be quite useful and promising for application on data that wild life researches have.

From attending conference in Belfast, joint mini-symposium at Oxford and field practice with badger researchers in Wytham woods, I could learn the most important lesson. Any research, work and activity regarding wildlife conservation, as well as, any other environmental approaches, must start from collaboration between scientists in different fields. So studying dynamics of species can't be done most effectively and fully without partnership of biologists, ecologists and mathematicians etc. Choice of partners may be the most important step in planning any activity, which might determine whether all project will be successful or not. Also, from my point of view, we should remember that collaboration between specialists with different backgrounds isn't always easy to establish, so it's important to be able to share common idea and be able to look on research from your colleagues' point of view. In my own experience I had hard time when I had to collaborate with cardiovascular surgeon to consult of properties of cardiovascular system. At that time I found out that we were talking on two completely different languages, math language from my side and biomedical from other side. Only tremendous patience and desire to achieve common goals helped that time to build interdisciplinary communication and share our knowledge and experience. Therefore, from my point of view, main lesson to be learned is to build partnership on the basis of same goals (and same understanding of it) and patience. We rarely can have enough knowledge to be able to understand all system in its full complexity, so partnership is essential for successful research.

I believe that this training gave me necessary understanding of partnership significance or my future work as a field-oriented leader and understanding how I can contribute to work connected with environmental issues and in particular to biodiversity conservation using my knowledge and background. Also it brings up new ideas for improving my PhD research. I hope that in future I will be able to develop mathematical model for effective estimation of influence of environmental factors on population dynamics of wild animals.

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Pellet sampling for monitoring of persistent organic pollutants in Mozambican coast.

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Destination and period: Mozambique, 1-10th September 2013

Key words: POPs, Temporal change, Plastic resin pellets

Abstract (approximately 200 words)

The objective of this training was to collect plastic resin pellets at same place in Maputo, Mozambique, where collaborators of our laboratory have collected pellets since 4 to 5 years ago to investigate marine pollution by persistent organic pollutants (POPs) and its temporal change. One of the locations we collected sample this time named "Portuguese island" is a beach where our collaborator surveyed in 2007. From the analytical result in 2007, the highest concentrations of HCHs was detected. So the main purpose of this field training in Mozambique was collecting pellets from the beach. Portuguese island is a desert island and it has beautiful beaches. Despite of such situation, we detected plastic pellets and fragments, and I realized a spread of plastic pollution though I have already known plastic pellets are detected all over the world including remote islands. In my master thesis, I will analyze the sample from Portuguese island to study temporal change of POPs pollution especially how the situation of HCHs pollution has changed since in 2007. The analytical results itself is important for understanding current situation of pollution and its temporal change as well as a first step of environmental improvement.

(1) Contents and activities during the overseas field training (less than 600 words)

I went to Maputo, Mozambique as field training to collect pellets for monitoring of persistent organic pollutants in Mozambican coast. During the stay in Maputo, we worked with Mr. Antonio Manuel dos Santos Junior who is an assistant lecturer in Eduardo Mondlane University (UEM). One of the reason why I have chosen Mozambique as a place to visit was that there are limited information about marine pollution in Mozambique. Especially in my target countries in graduation thesis about African countries (Ghana, Kenya, South Africa and Mozambique), the least information about marine pollution by POPs was available in Mozambique. We went to three beaches to collect pellets this time. The first place I wanted to go is

Portuguese island near Inhaca island. We have already analyzed the sample from Portuguese island collected in 2007 and detected the world highest level (35 ng/g-pellet) of *gamma*-HCH. *Gamma*-HCH is one of the POPs and had been used worldwide as an insecticide called "lindane" since 1950s. And it was banned by Stockholm convention in 2009 because of its toxicity. So I want you see how the pollution situation has changed since then. Portuguese island is desert island and its coast is very beautiful so we can't find pellet from beach at first. But as a result of excavating about 0.5 cm by plastic fragment, finally we found totally 77 pellets, approximately 9g weight, which would be enough number for my analysis. Although the number of pellets or fragments, plastic trashes such as cup for plastic bottle were not so many, the fact that we found them were impressive for me. Because I realized that even desert island, pellets have been beached so plastic pollution is spreading in the world. Of course I'd already know wide spreading of plastics, it was first time to have such experience.

Fig.1 Pellet sampling at Portuguese island

Fig.2 Pellets collected from Portuguese island

Two samples were collected near Maputo Bay. One of the locations is the same place as our collaborator collected in 2009. We need to consider if the samples can be used to investigate temporal change or not. This is because time span between the sampling should be 5 to 10 years for monitoring of temporal change using pellets, (Endo *et al*., 2013). Also, the beach was littered with garbage like street in Maputo. Street in Maputo city was strewn with garbage and they are burned at some places. Because garbage may contain chlorinated compounds due to non-separation of wastes, hazardous compounds like dioxin is probably emitted to the environment through incineration of garbage. The other sample from Maputo Bay may be influenced by discharge of sewage water which is probably mixture of miscellaneous drainage and lagoon treatment waste water of black water, which is similar process to primary treatment. Because there was drainage channel on the beach of yacht basin so this may be good sample for understanding of pollution by Pharmaceutical and Personal Care Products due to insufficient removal of it by the treatment process. In both case of Maputo, such environmental ramification occurs because of inadequate environmental management. So countermeasure for improvement of environmental management should be taken.

Fig.3 Drainage channel to the ocean

Fig.4 Cityscape in Maputo city

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

Plastic resin pellets are the industrial feedstock of plastic products and small granules with a diameter of a few millimeters. A small portion of them are unintentionally spilled into the environment during land handling and transport. Because polyethylene (PE) pellets, a major type of plastics, are lighter than water, such spilled PE pellets are carried by surface runoff, streams and rivers, and finally reach the ocean. Because of environmental persistence of these pellets, they are distributed all over the world. Hydrophobic organic pollutants are sorbed into and concentrated in the pellets from surrounding sea water (Mato et al., 2001). Beached pellets are detected from all over the world because of their persistence and increase of production. In our previous study, we conduct global monitoring of POPs by using pellets from over 170 sites, 40 countries which is called International Pellet Watch (IPW) and comparing with the monitoring using mussel which is popular way of POPs monitoring in the world. As a result of such study, utility of pellets as a media of POPs monitoring has been demonstrating (Ogata *et al*., 2009). We have conducted global monitoring of POPs by using beached plastic resin pellets,. Another researches showed that pellets can be utilized for understanding of temporal change if time span of sampling is taken 5 to 10 years (Endo *et al*., 2013, Ryan *et al*., 2012). So in my master thesis, I will analyze pellets from Portuguese island to understand pollution situation by POPs and its temporal trends. Through this visit to Mozambique, we obtained stronger connection with people in Mozambique, such as Mr. Antonio than before so we can ask people in Mozambique to collect pellets to be temporal sample. If this idea will work out, I can utilize analytical data of temporal sample in Mozambique as a template to understand temporal change of POPs by using pellets. Therefore, oversea field training is important for me because not only I could have precious experiences and get good samples from Mozambique, but also I could get connection with some Mozambican who would be helpful in the future.

(3) Achievements and its future vision (less than 400 words)

Pellet sampling is relatively easy and costs extremely low for sampling itself and shipment compared

to conventional ways using water, sediment and biological samples so people in the world can participate IPW project. Especially our counterpart has already known how to collect pellets, he can be collaborator by collecting pellets. If people live in Mozambique have interest in this results, further research could be taken by collecting pellets from some beaches in Mozambique in the future. After analysis and investigation, we will send an analytical result to the counterpart. When we send analytical result, we have to describe results and make discussion in keeping with counterpart's understanding of marine pollution or science. Otherwise the results will lose meaning or in bad case, it will cause misunderstanding. Also, we will upload analytical results to our web site (http://www.pelletwatch.org/) so that everyone can see the result and think about POPs pollution. By these two ways of distributing information, local people can get quantitative data about POPs of local regions. This data and information would be helpful to work on government about environmental issue because action for environmental improvement by local people tend to be lacked of quantitative data. Thus, our results will be able to be utilized for first step of improvement of environmental pollution or enhance environmental conservation awareness of local people in a bottom-up method. Furthermore, I hope this step would lead to improvement of waste problem in Mozambique. Way of waste disposal and sewage treatment I saw in Mozambique should be ameliorated to adequate way of treatment.

(4) Acknowledgement

We express special thanks to Eduardo Mondlane University about supporting our training and to Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa for its financial support.

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(Supervised by Hideshige TAKADA)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

The research in Ghana
~*Salmonella* in wild reptiles and the condition of livestock farming~

Emi Nagata
6th grade, Veterinary course, Department of Agriculture, Tokyo University of Agriculture and Technology
Destination and period: Ghana, 2013 Sept.23-Oct. 6

Key words: agama, gecko, *Salmonella*, livestock farming, importation

Abstract (approximately 200 words)

Research 1: The research of *Salmonella* in wild reptiles

Captured wild geckos and agamas, and isolated *Salmonella* from their feces to know their carry rates of *Salmonella*. Feces of reptiles are the main cause of *Salmonellosis* in South East Asian countries. From this research, *Salmonella* was isolated from 3.7%of geckos and 23.0% of agamas. This fact suggests that the risk of *Salmonella* infection transmitting seems to be low in geckos and high in agamas in Ghana. To reveal the relation between the *Salmonella* carriage in agamas and human *Salmonellosis*, researches among human are also needed.

Research 2: The research of the condition of livestock farming

I did questionnaire survey to livestock farmers in Ashanti region and Central region. The main economic activities in these regions are agriculture, which 44% and 54% of its population respectively engage in it. To know the state of livestock farming in these regions, I asked them what kind of animals they have, how much do they earn and what is the problem in his/her farm. As a result, there was common problems in farms, such as the luck of funds, diseases and high cost for production.

(1) Contents and activities during the overseas field training (less than 600 words)

Title: The research of *Salmonella* and livestock in Ghana

Supervisor: Assoc. Prof. Hideki Hayashidani

Schedule:

9/23, 24: flight (Tokyo-Accra)

9/25: Meeting with Dean John. Go to Vet. School in UG.

9/26: Lecture about reptiles in Ghana By Prof. Daniel K. ATTUQUAYEFIO.

9/27: Looked around inside campus. Went to poultry farms.
9/28: Questionaire survey to farmers in Central Region.
9/29: Moved to Kumasi.
9/30: Questionaire survey in farms.
10/1: Lecture about livestock in Ghana by P.K. KARIKARI. Visit Dr. Odai. Came back to Accra.
10/2: Visit Eastern Region, Kade Agricultural Research Institute.
10/3: Visit Cape Coast.
10/4: Visit UG, Legon. Leave Accra in the evening.
10/6: Arrive at Tokyo.

<*Salmonella* transmitting in Ghana>

Feces of reptiles are the main cause of *Salmonellosis* in South East Asian countries. This time, the *Salmonella* carry rates of wild geckos and agamas are researched. From this research, *Salmonella* was isolated from 3.7% of geckos and 23.0% of agamas. This fact suggested that the risk of *Salmonella* infection transmitting seems to be low in geckos and high in agamas in Ghana. To reveal the relation between the *Salmonella* carriage in agamas and human *Salmonellosis*, researches among human are also needed. Furthermore, we could see just a few geckos inside the university or in the town. This is the big difference between Ghana and South East Asian countries, that there are so many geckos inside and outside the houses in South East Asian countries. Instead of geckos, there were many agamas. Therefore, the risk of Salmonella transmitting seemed to be low in geckos and high in agamas in Ghana.

<Problems of farming in Ghana>

I did questionnaire survey to livestock farmers in Ashanti region and Central region. The main economic activities in these regions are agriculture, which 44% and 54% of its population respectively engage in it. To know the state of livestock farming in these regions, I asked them what kind of animals they have, how much do they earn and what is the problem in his/her farm. As a result, there were common problems in farms, such as the high cost for production, diseases and the luck of funds.

Most materials in Ghana are imported from foreign countries, such as England, Netherland and South Africa. That leads prices higher and domestic industries damaged. The agriculture is also damaged too. For example, chicks for poultry are imported. Imported chicks are high costs for farmers.

Diseases are man-caused. The employment environment in Ghana is bad. Employees said that sometimes they cannot get wages so they don't want to work. On the other hand, employers said that employees don't work properly. There is no trust between an employer and an employee. Because of bad works of employees, animals become sick. Then the profit of the farm decreases and the employer cannot pay wages to employees. That would decreases the motivation of employees and the management of the farm get much worse.

For these reasons, continuing the farm in Ghana is very difficult. Many people think a farming does not make profit. Therefore, bank or government hesitate to pay funds for farmers. That makes farmers more difficult to continue their work.

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

・The carry rate of *Salmonella* in wild agamas was high and there were many agamas in human's living environment. This result suggests that wild agamas play an important role as a reservoir of *Salmonella*. Not many people know that reptiles carry many pathogenic bacteria, so researchers should spread their knowledge to locals and call for their attention.

・Livestock farms in Ghana are going out of businesses. The luck of funds, diseases and a large quantity of imported products are driving local farms into retirement. People working in farms will lose their jobs and the economic condition of the area will be worsen.

・The experience in Ghana changed my understanding about Africa. I thought Africa is suffering from poverty, but it was not always true. Ghana is not a rich country indeed, but most people living there were thinking that they are not poor. They were even angry at the stereotype made by developed countries that tells Africans are poor.

(3) Achievements and its future vision (less than 400 words)

From the research of Salmonella carry rate of wild geckos and agamas, the risk of Salmonella infection transmitting seems to be high in agamas in Ghana. Not many people know that reptiles carry many pathogenic bacteria, so researchers should spread their knowledge to locals and call for their attention. To clarify the relation between the Salmonella carriage in agamas and human *Salmonellosis*, researches among human are also needed.

From the questionnaire study to livestock farmers, serious problems of Ghanian society were revealed. Ghana has rich natural resources and people who want to develop the country, but there is no social infrastructure to make good use of them. It is not easy for us to consider how Japan can support Ghana to make its social infrastructure, but one idea will be the training of people and let them make a good economic cycle in their country. They need to reduce imported products and try to increase "Made in Ghana" products. I want Ghanian people to go out of Ghana and see good points of other countries, and take it back to Ghana.

(4) Acknowledgement

I am deeply grateful to Professor Agyeman, Professor John Osofu Anim and Professor Benjamin Sabi.

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(Supervised by Hideki Hayashidani)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Sustainability assessment of agricultural practices in Ghana

Eri MATSUURA
1st year of the three-year Doctoral course on Department of Agricultural and Environmental Engineering,
United Graduate School of Agricultural Science,
Tokyo University of Agriculture and Technology
Destination: Ashanti, Eastern and Central Region of Ghana
Period: 23rd September to 6th October 2013

Key words: small-scale farming, plantation, cover crops, sustainable agriculture

Abstract (approximately 200 words)

Agricultural sector in Ghana plays an important role in the economics. However, most farmers remain low productivity and poor income due to poor fertility of the soil and traditional agricultural practice while there are more domestic demands on the staples and vegetables. To identify the current situations and assess sustainability in agricultural practices, field training was conducted in the southern part of Ghana. The field training consists of lectures, group interviews to farmers and extension officers and visiting plantations and research institutes. Observation in the fields provided valuable information that I did not learn from literature. A cover crop system has already been introduced at an oil palm plantation. On the other hand, although most small-scale farmers should give priority to improve their livelihoods but they had no technical supports to use it. As many local farmers wished to use fertilizers and agricultural equipment to improve crop yield but they won't be allowed due to financial reasons, training for sustainable agricultural approaches could be held in the future to provide alternative solutions to them.

(1) Contents and activities during the overseas field training (less than 600 words)

Title: Sustainability assessment of agricultural practices in Ghana
Supervisor: Dr. Siaw Onwona-Agyeman (TUAT)
Dr. Masakazu Komatsuzaki (Ibaraki University)
Counterparts: University of Ghana, College of Agriculture and Consumer Sciences,
Prof. John Ofosu-Anim and Dr. Edward Benjamin Sabi

Background

Ghana's economy strongly depends on agriculture such as cacao and timber. They are major export goods and cover 40 % of GDP in Ghana. However, the staple productions such as rice and corn are not enough to meet domestic demands. In fact, Ghana has 70% of trade deficit in rice and 15% in maize. This -is caused by several reasons - the change of diet preference, government encouragement to cultivate commercial crops and low productivity in traditional agricultural practice. Average 56% of the nation engages agriculture (75% in rural area) and 90% of these farmers are small-scale and rely on rain-fed farming systems (Takane 2003), which bring them low income.
Due to low income, they cannot access to agricultural materials such as fertilizers and better equipment.

Moreover, half of the agricultural land faces the problem of land degradation due deforestation and slash and burn agriculture (ADPA 2009). Gold mining, which is one of the major export industries, also contributes to land degradation. Meeting domestic demand for the staple is important in terms of Ghana's economics and food security. Therefore, sustainable agriculture approaches such as the use of cover crops and manure application is needed to improve the current situation.

The aim of this training was to gain an insight into the current situation and local knowledge of sustainable agriculture in Ghana and to assess sustainability in their practices.

Training content

1) Lectures were given by professors at University of Ghana (UG) and Kwame Nkrumah University of Science and Technology (KNUST) at the beginning of the field training.
2) Two focus group interviews (FGI) were curried out to vegetable farmers of Central region and cacao farmers of Ashanti region.
3) Individual interviews to agricultural specialists at UG and agricultural extension service of regional governments in Eastern region and Central region were conducted to understand current issues on the staple production.
4) Visiting The Forest and Horticultural Crops Research Centre, Kade (FOHCREC, Kade) and the largest oil palm plantation in Ghana (Ghana Palm Oil Development Company)
5) Field observation was done through the training.

Training schedule
23-24 Sep: Traveling from Tokyo to Accra via Dubai
25 Sep：Meeting with Prof. John and visiting Department of Veterinarian Science, UG
26 Sep：Lectures on cover crops and reptiles at UG
27 Sep：Interviews at Department of Agricultural Extension
28 Sep：Group interview to vegetable farmers at Central Region and visiting grasscutter farm
29 Sep: Traveling from Accra to Kumasi and visiting a poultry farm
30 Sep：Group interview to cacao farmers at Ashanti region
1 Oct: Lecture on animal production at KNUST and meeting with Dr. Odai

2 Oct: Visiting Agricultural Research Institute of UG, Kade, Eastern Region
3 Oct: Visiting Cape Coast Castle and interviews at Extension Office of Central Region
4-6 Oct: Traveling from Accra to Tokyo via Dubai

(2) Findings and achievements obtained, significant experiences and lessons (less than 600 words)

1) Lectures

Learning agricultural practices by literature or lectures before starting a field work is much efficient when you make a plan of a field work. The difference in agricultural practice between Japan and Ghana also needed to be considered. For example, while it is common to use tillage with machinery in Japan, most small-scale farmers in southern Ghana do not till the land. Also, as a tropical climate with two rainy seasons, weed removal is recently done by herbicides or weeding while they naturally die in the winter in Japan. It might be common sense for farmers but I have never thought of it. I thought most of plants could grow well in tropics but never thought how to terminate it. It made me realize I blindly had a solid idea based on Japanese agricultural practices.

2) FGI

According to Ghana living standards survey report of the fifth round (GLSS5, Ghana Statistical Service 2008), an average 51% of people in rural areas can read and write in simple English or a local language. I was prepared to give a questionnaire on an individual basis. However, the farmers did not understand English more than the result of GLSS5 so I needed to ask questions through an interpreter. I learned that results based on statistics may not always reflect society's needs in reality. This is the reason why field-oriented leaders are needed to identify real problems and solve them effectively.

3) Interviews to agricultural specialists

It is interesting to learn that most of extension officers I interviewed were not keen to help farmers because the farmers they trained seemed to lack in gratitude but also complain very much to them. The officers also told me that most farmers do not pay back loans from the government to farmers. Moreover, it is obvious that one extension officer cannot take care of too many farmers without adequate funds. For example, 5000 farmers per one extension officer in Ejisu-Juaben District, 1500 farmers in Gomoa west district and 3000 farmers in Winneba town. It is very reasonable to see both points of views and no one to blame the situation to cause some tension between extension officers and farmers. A free talk session with few questions was a good strategy to hear their real voices.

4) Visiting the plantation

It was very informative to see a real plantation with living mulch applications. I learned the differences between Tripical kudzu *(Pueraria phaseoloides),* velvet bean *(Mucuna bracteata) and* butterfly pea *(Centrosema pubescens)* and how soil textures differ from no-living mulch treatment. Although there are

some local varieties of mucuna beans in West Africa, the plantation imports a different variety of mucuna seeds from India due to their effectiveness as living mulches.

5) Field observation

I did not have enough time to see all vegetable farms I interviewed, but I was able to see the structure of some farms. If I could measure the structure of farms and collect data of yields and income, it would have been possible to obtain more useful information.

Most farmers had a problem with purchasing fertilizers and herbicides because of poor income. At least they need to buy seeds. It makes them stuck to a depth. I met many farmers that loan seeds and herbicide in advance from an agricultural shop then return the money as soon as they got cash income by selling their products. It looks not sustainable way to live to me.

However, there is no alternative way to solve it. I thought making manure from agricultural residues and droppings could be good option for them, but they are not keen to make manure and introduce living mulch because they think it is not right to mix dirty things into crops. It made me realize the importance of understanding social backgrounds and what they think value for. If I have another opportunity to visit them next time, I would give mini lectures to educate how cover crops could help to improve soil quality in the long term and help their livelihoods.

(3) Achievements and its future vision (less than 400 words)

Achievements

This training improved my interview skill and flexibility to adjust to different situations. I was really glad to see many Ghanaians who studied at Japanese universities and now playing very important roles at their institutes. They have introduced new technologies and values from Japan and succeeded in the society. It was a good opportunity to have some new contacts for future corroboration.

This trip made me realize complicated difficulties in Ghana. The issues cover from social/ political issue to economic issues. In general, the tropical countries tend to have poor soils to grow crops with low agricultural technology. Visiting Ghana gave me an opportunity to learn which issue goes priority.

It seemed the local people are not aware of what the consequence would be if they keep having the traditional agricultural practice. So the increase of environmental awareness in the local people is important to change the society and I would like contribute to increase the number of people who will work on environmental issues.

I finished my first experiment last year. After this training, I started reconsider my experimental deign to test more practical method in living mulch. I learned more local plant species that could be candidate for a cover crop. I believe each agricultural practice has benefits and drawbacks. I understood the current situation better by visiting the field and earned some ideas what technology would be more appropriate and practical. It will be reflected to my PhD project. I would like to analyze social, economic and environmental aspect on using cover crops and will come realistic for the second experiment.

Future vision

What I would like to do now is to provide supports to international students to help them learn practical skills at the lab so that they could apply it practically in their countries. I believe this is a small step towards international cooperation while I am a student.

I got an impression that many locals looking for an opportunity to improve their lives and would like to do something with Japanese organizations but they did not know how to approach it. In the future, I could be a coordinator to connect these people to create new business/ research opportunities. In this way, Japanese organizations can introduce their knowledge and technology, which will improve the livelihood of local people in Asia and African countries towards sustainability.

(4) Acknowledgement

I would like to thank all collaborators - farmers, extension officers and senators who helped in the gathering farmers at their towns. This training would have been impossible without local supports from the staff of UG and KNUST, especially Professor John and Dr. Benjamin. I also would like to express my gratitude to FOLENS staff, especially Agyeman sensei, Ozaki sensei and Ms. Shimada for supporting the documentation aspect of the training.

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(Supervised by Dr. Siaw Onwona-Agyeman)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

"Implementation Australian Weeds Strategy (AWS) in New South Wales, Australia"

MISHYNA Maryia
The United Graduate of Agriculture, Department of Biological Production Science
Destination and period: Charles Sturt University, Wagga-Wagga, Australia, 29 Oct – 15 Nov 2013

Key words: invasive plants, Australia, biodiversity, allelopathy

Abstract

Overseas field training "Implementation Australian Weeds Strategy (AWS) in New South Wales, Australia" was conducted in Charles Sturt University, Wagga Wagga, Australia from 29 October to 15 November 2013. Overseas field training had included visiting Graham Center for Agricultural Innovation, Livingstone National Park, Wagga-Wagga Botanical Garden etc. The training was conducted in an invasive weed ecology/biology/rhizosphere research program for educational purposes. The aim of field training was study of scientific basic of Australian Weed Strategy and screening the phytotoxity of Australian plants.

During the field training had collected and tested of some native and invasive plants had shown a wide range of inhibitory (i.e. *Anigozanthos manglesii, Callistemon citrinus*) and stimulatory activity (i.e. *Araucaria excels, Xanthorrhoea semiplana*). It should be a great potential for future for biopesticides and novel plant growth regulators creation. Field observation and monitoring of invasive plants in Australian desert had shown unsolved problems of invasive plants eradication and their harmful effect on plant biodiversity. As well, extraction and identification of some secondary metabolites (such as naphthoquinones) was conducted in a laboratory. Overseas field training gave me an opportunity to study some novel plant extraction and analyzing methods, which could be useful in my research.

(1) Contents and activities during the overseas field training

Many Australians as private and public landowners, land managers and land users spend a great deal of time and effort in dealing with weeds. In financial terms alone, many millions of dollars are spent annually on research, education and training in weed management and on herbicides and other weed control measures. Despite this input, weeds are still one of Australia's major land degradation problems.

Weeds are among the most serious threats to Australia's primary production and natural environment [Australian weeds strategy…, 2007]. They reduce farm and forest productivity, displace native species and

contribute significantly to land degradation. The cost of weeds to agricultural industries alone has been estimated at over $3.3 billion per annum.

To solve the problems of weed distribution, introduction of new species with aggressive properties in 1997 the Australian Weeds Strategy (AWS) was started. The Australian Weeds Strategy provides a framework to establish consistent guidance for all parties, and identifies priorities for weed management across the nation with the aim of minimizing the impact of weeds on Australia's environmental, economic and social assets. The Australian Weeds Strategy emphasises the importance of preventing new weeds from establishing and the need to respond quickly to incursions. The Australian Weeds Strategy identifies the following goals and objectives to realize its vision:

1. Prevent new weed problems
2. Reduce the impact of existing priority weed problems
3. Enhance Australia's capacity and commitment to solve weed problems

It should be noted that good science underpins one of the crucial input in the effective development, monitoring and review of weed management strategies.

In this connection, research of weed ecology, estimation of phytotoxic potential, searching of biological method of control are necessary to productive agriculture.

Overseas field training "Implementation Australian Weeds Strategy (AWS) in New South Wales, Australia" was conducted in Charles Sturt University, Wagga Wagga, Australia to study Australian experience of invasive plant research. The program was held for a period from October 29 until November 15, 2013 and was organized by Charles Sturt University and Prof. Leslie Weston, research professor of Plant Biology at Charles Sturt University. The training was conducted in an invasive weed ecology/biology/rhizosphere research program for educational purposes.

Overseas field training had included visiting Graham Center for Agricultural Innovation and Livingstone National Park, Wagga-Wagga Botanical Garden conducting laboratory extraction, identification of some secondary metabolites (such as naphthoquinones) of *Echium plantagineum*, determination of phytotoxic activity of some native and invasive plants by using Sandwich method [Fujii Y., 2003].

Under the guidance of Prof. Leslie Weston field observation (6-8 November 2013) of Australian bush grass desert phytocenosis, phonologic research and plant samples collection was conducted. Presentation on laboratory seminar with the participation of Prof. Fujii Y. was done.

(2) Findings and achievements obtained, significant experiences and lessons

As my interested research background and my doctor's course thesis are relating to invasive species and theirs biological active substances, possible ways of its eradication. From other side, Australia is a unique place where we can search invasive plant distribution, biochemical changes in dynamics because Australia is an independent continent with well-known history of plant introduction thus plants have evolved uniquely.

During my overseas field training I had a unique chance to study Australian flora together with Australian scientists and participate in their field experiments (phenology, biometric analysis, collecting of herbarium and plant sampling for genetic and biochemical analysis). According a field training plan plant

samples (leaves, flowers etc) were collected and tested by using Sandwich method (Fujii Y., 2003). The results had shown significant inhibitory activity by *Callistemon citrinus* flowers (62.58-84.71% and 42.51-62.51% of lettuce radicle and hypocotyl inhibition respectively), which native bush to Australia. Same result was found to needles of Australian pine *Casuarina equisetifolia* (10 mg inhibited radicle growth by 21.92% and 50 mg – by 63.96%).

Interestingly, that many native species had shown strong stimulatory activity, such as coniferous *Araucaria excels, Xanthorrhoea semiplana* ("Grass tree"). It should be perspective plants to using in biopesticides development.

One of the most famous Australian grass *Anigozanthos manglesii* ("Kangaroo pawn") had shown also inhibitory effect to primary lettuce growth (50 mg of plant sample; 13.73 and 17.99% of radicle and hypocotyl inhibition respectively. Thus, *Anigozanthos manglesii* appear to be dominant in phytocenosis and rapidly distribute beyond their native area, suppressing other plants.

As for invasive plants, screening of leaves and flowers of *Echium plantagineum* ("Paterson's curse) had shown high inhibitory activity of flowers (57.96 and 8.62% of radicle and hypocotyl inhibition respectively) then steams. Unfortunately, because of dry weather collect of fresh leaves was not possible. But it should be interesting to screen fresh leaves and root on phytotoxicity to other native and invasive plant species. As a conclusion, Australian native coniferous and invasive *Echium plantagineum* had shown a tendency to inhibit of other plants.

From my view of point, using Sandwich method is useful tool in plant risk assessment analysis of weeds and novely introduced plants and can be used in Australian Weeds Strategy. However, for more detailed information, it is desirable to carry out experiments using other cultures for bioassay.

Here is good example for already well-known and commercial available biopesticides on the basic of cineole-based eucalyptus oil. As well, in US eucalyptus oil is widely used as insecticides and miticide.

Further, Australian plants have a great potential as a source of biological active compounds. They can be used for creation of ecological friendly new plant growth regulators and biopesticides as well.

During my overseas training trip I was involved in some university activities such as trip to the gold mines, visit city botanical garden, tour of the mine opals, visit the Australian restaurant etc.

(3) Achievements and its future vision

Through this overseas field training I had extended my knowledge in invasive plant problems, their methods of control and risk assessment methods, which significantly differ from those in Belarus and Japan.

Australian Weed Strategy shows significant advances in the prevention of entry of new weed species and control of already introduced plant species. Especially admires the communication between scientific research and their practical implementation in practice. I would like to note a good organized public familiarity with information about weeds, their identification, control via the Internet, numerous posters, for example, in the botanical gardens etc. I hope that my country will create such relevant resources.

Moreover one of the most important and the main measure to prevent the introduction of new invasive species is a strict border plant quarantine system.

Monitoring of invasive plants in bush grass desert

Collection of plant samples, Livingstone National park

As a result of this overseas field training I had received a lot of knowledge about native and invasive Australian plants, novel research technique and methods, which may be useful in my future research. As well, this overseas trip gave me a lot of experiences on weed ecology. I am sure that in the future I will contribute my knowledge and experiences to control weed using the biological and chemical methods in the developing countries of Africa and Asia.

I hope my overseas field training will initiate our cooperation with Australian scientists.

(4) Acknowledgement

The report could not have been researched, complied and written in this circumstance without financed and the dedicated assistance of the FOLENS and its professors. I am grateful for the level of cooperation and assistance provided by virtually every person whom the inquiry staff and I consulted.

I would like to express my deep gratitude to Prof. Y. Fujii and Prof. L. Weston, my research supervisors, for their patient guidance, enthusiastic encouragement and useful critiques of this research work.

Finally, I wish to thank my parents for their support and encouragement throughout my research.

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(Supervised by Prof. FUJII Y.)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Field Investigation of Groundwater Quality in Bangkok

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Destination and period: Bangkok, 2013 / November, 25-29

Key words: Aquifer, Seawater, Environment, water quality, EC

Abstract (approximately 200 words)

Between 2013/11/25 and 2013/11/29 we have conducted a field training in Bangkok, Thailand. The objective was to investigate one aspect of the groundwater of the aquifer complex in Bangkok. In situ measurements of electro-conductivity (EC) and temperature were done from 14 locations (of monitoring wells). These measurements targeted 3 superposed aquifers identified by the code names, from top to bottom, by PD, NL and NB. Salinity maps constructed from the measured EC values showed that the aquifer NB has the best water quality (salinity mostly lower than 0.9 g/L); while the shallowest aquifer (PD) displayed a lower water quality compared to others,(more than 2.05 g/L as salinity value on the investigated area). Aquifer NL, intercalated between the 2 mentioned above, has lower quality than NB (located below it) but seems have a better water quality than the aquifer PD (located above it). However this aquifer NL has salinity value often greater than 1.0 g/L. This shows that the deeper the aquifer the better is its water quality. It also indicated that the groundwater depletion occurred in the shallowest aquifer and that the seawater intrusion started to take place as if it was submerging the underlying aquifers.

I. Contents and activities

The field training in Bangkok, Thailand, took place between 2013/11/25 and 2013/11/29. We were accompanied by Professor Yuji Kohgo and Associate Professor Hirotaka Saito, our supervisors. This trip was facilitated by Assistant Professor Aksara Putthividhya of Chulalongkorn University. On November the 25th, field visit preparations were set throughout a meeting we had with members of the Department of Groundwater Resources (DGR) of Thailand. In this session, main problems related to groundwater were presented. We also had to clarify our aims, goals of FOLENS program and main research orientations in our laboratories.

Initially, we planned to collect the groundwater electro-conductivity, temperature, water table and localization data from 54 wells. However, after discussing with the DGR members, the planning was changed due to some constraints. Finally a set of 20 monitoring wells were proposed by them. Thus, an objective of data collection from 5 locations per day was set.

The main goals of this field survey were:

1. To experience one aspect of groundwater quality field survey;
2. Gain an understanding of seawater intrusion in a multi layered system of confined aquifers;
3. Use the collected data for seawater intrusion simulation as a trial in my own study.

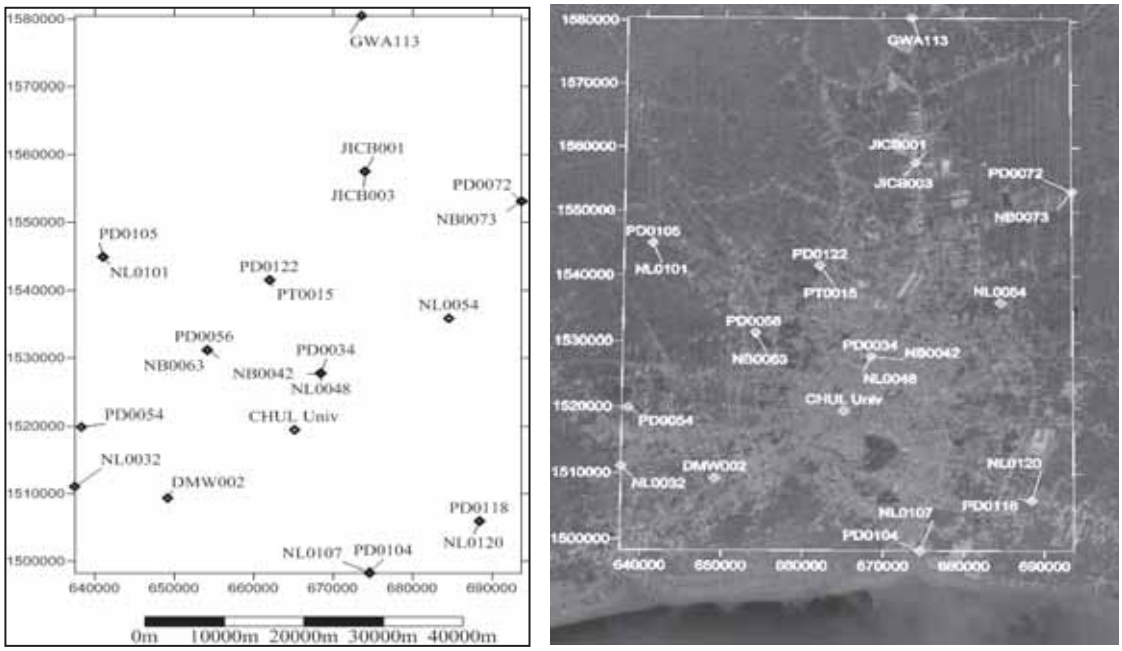

Figure 1: location of visited monitoring well; (a): base map, (b): map overlaid on Bangkok area (satellite image on (b) is from Google Earth)

Bangkok (Fig. 1(b)) is located on the delta of the Chao Phraya River; its population has doubled between the 1970s and 2000. Rapid development of the city was a cause of the population increase which is nowadays over 6 million. The region of Bangkok extends on 10,315 km^2 while the metropolitan area extends on 2,844 km^2 for a population density, in the metropolitan area, of 3727 people/km^2 **[2]**. The consequence of such a situation led to a high demand on water resources.

This study required us to take in situ measurements, in groundwater monitoring wells, using an electro-conductivity (EC) and temperature diving sensor. The sensor was attached to a graduated 100 meters length cable; allowing us to take measurements every 10 meters into the borehole. The sensor has to be programmed in order to take measurements every 10 seconds; the water table was also measured. The groundwater system beneath Bangkok consists of 8 levels (table 1) **[7]**. Our target was the aquifers PD, NL and NB.

Table1: Groundwater system under Bangkok area

Aquifer	CODE	Zone
Bangkok Aquifer	**BK**	50-m
Phra Pradaeng aquifer	**PD**	**100-m**
Nakhon Luang Aquifer	**NL**	**150-m**
Nonthaburi Aquifer	**NB**	**200-m**
Sam Khok Aquifer	**SK**	**300m**
Phaya Thai Aquifer	**PT**	350-m
Thonburi Aquifer	**TB**	450-m
Pak Nam Aquifer	**PN**	550-m

Source: *World Bank website*

In table 1, the gray pattern indicated the aquifers we have targeted.

The literature about groundwater resources exploitation of these aquifers with regards to environmental changes seems to be more oriented on land subsidence related problem rather than groundwater quality degradation. Only few of our references did give a brief description about groundwater quality. Groundwater depletion in coastal aquifer usually induces seawater intrusion which in return causes the fresh water quality reduction. And heavily depleted aquifer causes the creation of more void spaces in the aquifer. Then large ground surface pressure from metropolitan areas, located on top of such depleted aquifer, may cause the compaction of this aquifer; in other words land subsidence happens.

The DGR members indicated to us that the most serious issue, from their perspective, was the land subsidence. A report of some cases studied by the Institute for Global Environmental Strategies (IGES), based in japan, however did mention about the risks of groundwater quality deterioration in Asian cities **[4]**. They state: 'The pollutants differ from place to place, and are even site specific, but naturally occurring pollutants (e.g. fluorine), salinization due to sea water intrusion, and coliform contamination caused by domestic waste water were identified''**.** Land subsidence issue is an existential problem[1] and is due to (i) Over-pumping of groundwater and (ii) loading and settlement of the upper clay layer[2] **[5].**

II. Findings and achievements obtained, significant experiences and lessons

EC was measured along with the temperature. It was noted that the temperature increased when measurements were progressively deepened within the borehole. This temperature variation between the water table and the deepest measurement point was generally between 1 and 2°C. However, this variation didn't affect the corresponding EC values that much (for EC: generally 0.05 to 0.2 gap between the shallowest and the deepest measurement point). Tables 2 to 5 indicate the EC values at different wells. Figure

[1] According to our discussion with the hosts the land subsidence problem is more important than any other known issue
[2] Soft clay layer within the aquifer complex beneath Bangkok

2 give a descriptive and representative profile of EC and temperature measurements at 3 wells.

Table 2: measured EC values on monitoring wells belonging to aquifer PD

EC value in mS/cm					
PD0054	**PD0034**	**JICB003**	**PD0122**	**PD0118**	***PD0104***
1.27	3.4	1.65	4.62	3.33	2.00

Table 3: measured EC values on monitoring wells belonging to aquifer NL

Wells aquifer NL / EC value in mS/cm			
NL0054	**NL0107**	**NL0032**	**NL0101**
0.92	6.37	1.66	1.26

Table 4: measured EC values on monitoring wells belonging to aquifer NB

Wells aquifer NB / EC value in mS/cm				
NB0042	**Chul Univ**	**NB0063**	**JICB001**	**NB0073**
0.60	6.00	0.54	0.52	1.69

Table 5: measured EC values on monitoring wells belonging to other deeper aquifers

Wells deeper aquifer / EC value in mS/cm		
GWA113	**DMW002**	**PT0015**
0.49	0.30	0.73

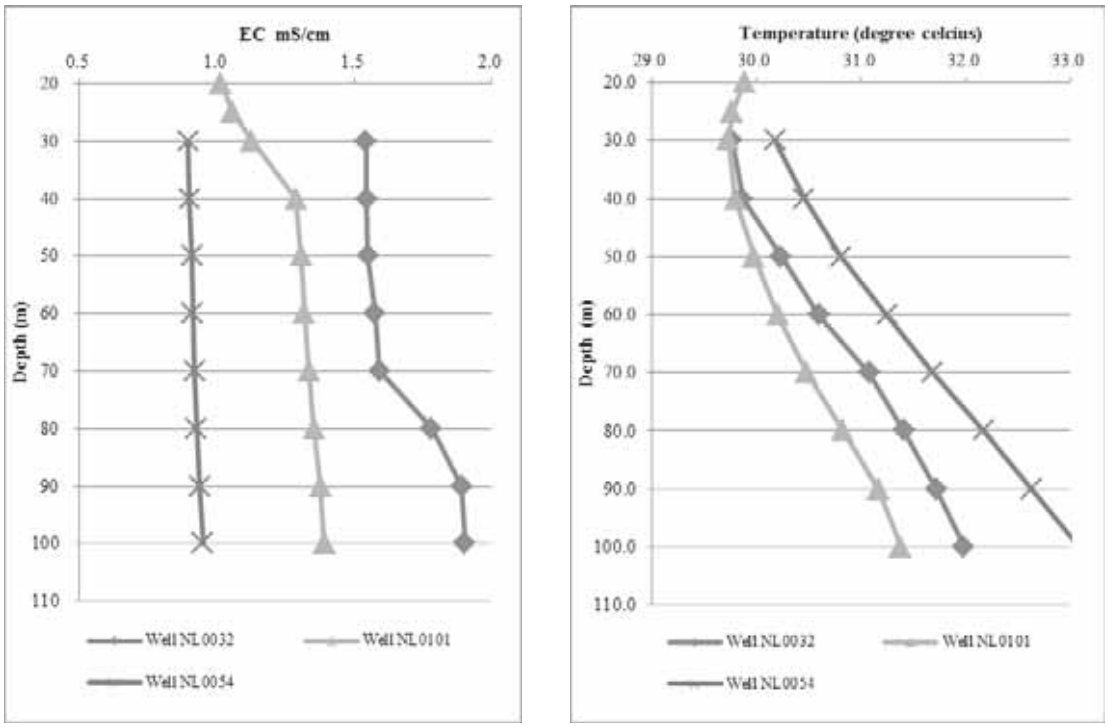

Figure 2: (a): typical EC profile within wells (3 wells); (b): typical temperature profile within wells (3 wells)

Collected EC values from these 3 levels were converted to salinity and mapped for every specific aquifer with GIS software. Mapping was also done for the different aquifers' water table. The salinity maps showed that the NB aquifer has lower salinity compared to the 2 others. The map in Fig. 5(b), aquifer NB, shows relatively low salinity values while the highest salinity are found in the south which is closer to the Gulf of Thailand.

The PD aquifer, shallowest one among the 3, has however higher salinity values (Fig 3(b)) and displays a completely different salinity distribution compared to NB aquifer (Fig. 5(b)) and NL aquifer (Fig. 4(b)). For aquifer PD (3(b)), contour lines indicate high salinity values converging toward a center point located nearby the well PD0122 (salinity approaching 4.0 g/L)...

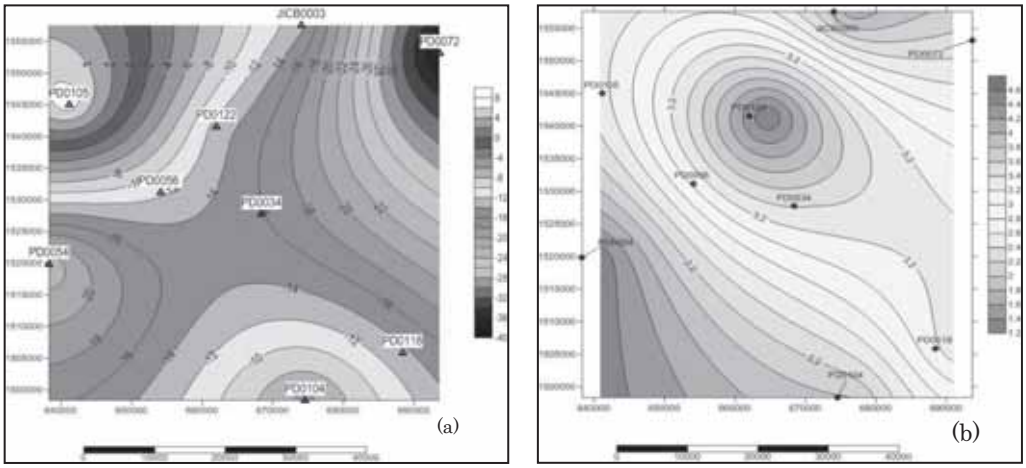

Fig.3: (a) Water table contour (unit m) of PD aquifer; (b): salinity contour of the PD aquifer (unit g/L)

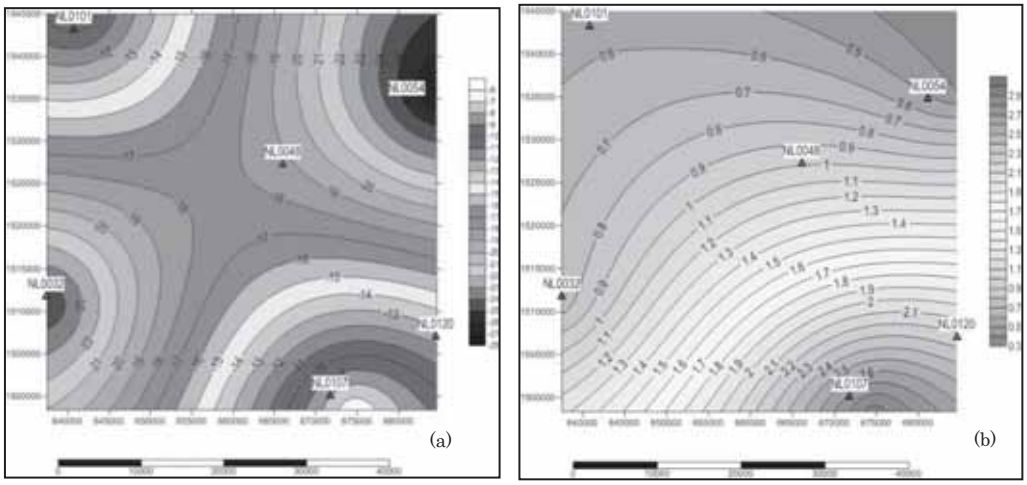

Fig. 4: (a) Water table contour (unit m) of NL aquifer; (b): salinity contour of the NL aquifer (unit g/L)

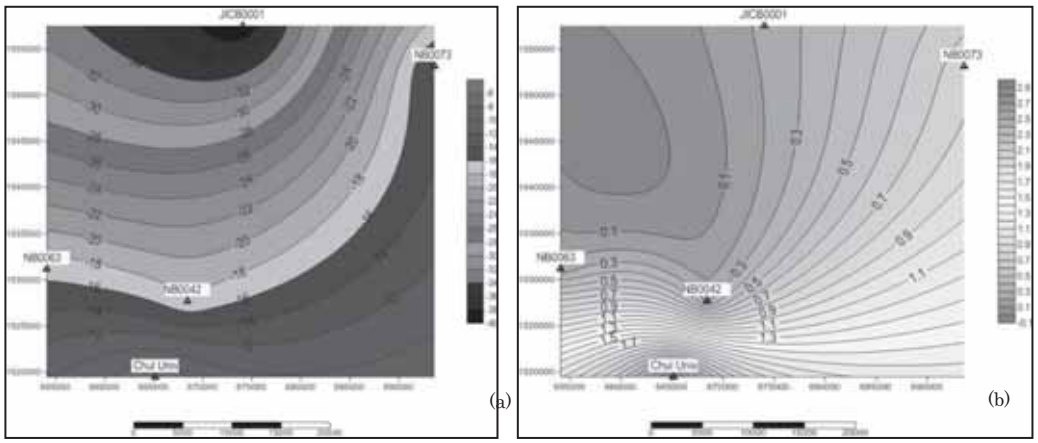

Fig. 5: (a) Water table contour (unit m) of NB aquifer; (b): salinity contour of the NB aquifer (unit g/L)

For aquifer NL (Fig. 4(b)), the salinity decreased northward and northwestward while higher salinity values are noted in the south (ranging between 1g/L and 3.0g/L)

Some measurements in deeper aquifers of this complex were taken and it was noted that the deeper the aquifer location, the lower the groundwater EC.

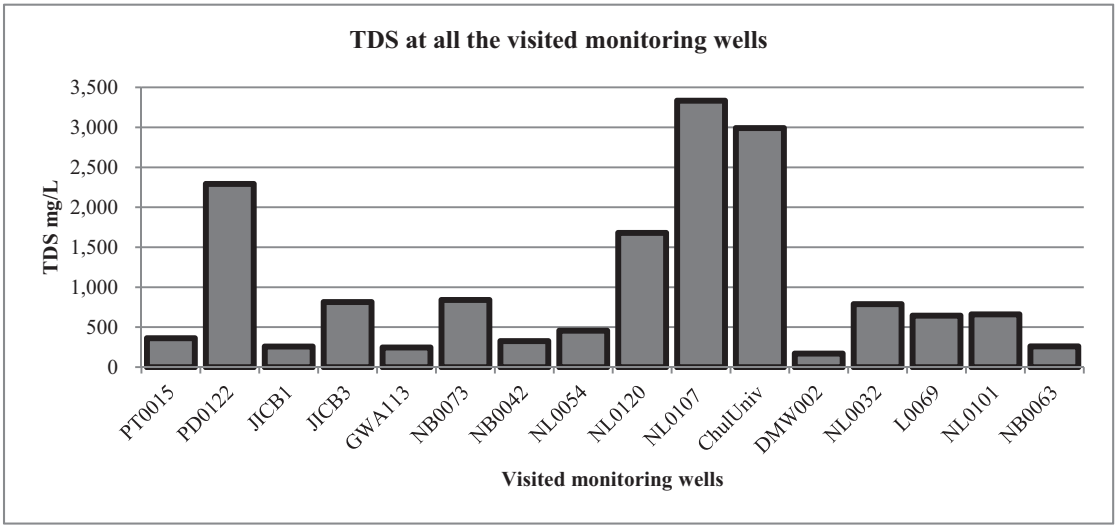

Fig. 6: Estimated Total Dissolved Solid (TDS) from the measured EC values of the visited monitoring wells

Referring to the guideline for drinking water, by the World Health Organization (WHO), we can alternatively use the TDS values (Fig. 6) to interpret the data. Thus, this would lead us to say that TDS values lower 600 mg/L are indicative of a good water quality (especially regarding its palatability) **[8]**. As for wells with TDS values between 600 and 1200mg/L the quality might be considered acceptable. However, TDS greater than 1200 mg/L might not be commonly recommendable for consumption. However according to the Thai standard, the allowable limit is between 750 and 1500mg/L **[2]**.

Even though the data we have collected were limited, they however confirmed the reality of the seawater intrusion which is already known **[7]**. This limited study is not meant to conclude in the existence of seawater intrusion; rather the above comment was done after simple analogy from other reference **[1, 2, 3,**

4, and **5]**.

In this field trip we conducted a survey to measure one parameter or water quality indicator: EC. Measurements were done on a multi layered confined aquifer system (PD, NL, and NB among others) beneath Bangkok. Measured EC values from aquifers PD, NL and NB were used to construct salinity maps for each aquifer. The maps showed also that the salinity decreased progressively towards the north. In another hand, it was noted that the deeper the aquifer location, the lower was the EC value. Another remark was the temperature measured into the borehole was increasing with the depth of the measurement; these measurements done simultaneously with EC would allow us have more precise EC value.

The practical experience from this trip has familiarized me with the innovative tools we had used to collect the data. Experiences gained in the preparation period and during the fulfillment of the trip regarding the interaction with different people would be very beneficial for my future career in the environmental field.

III. Achievements and its future vision

The field trip we conducted in Thailand, Bangkok, allowed us to measure EC, temperature and water table; these are basic parameters when investigating groundwater in general. The EC value is an indicative parameter of water quality (can indicate water salinity). However the experience learnt from the groundwater related issues in Bangkok is important for me and will cause me to take into account different aspect related to the environment, when planning future groundwater exploitation in my country. This is due to my sudden awareness regarding land subsidence which in fact when it isn't detected may lead to severe disasters when events such as floods occur. Therefore I have become more attentive regarding the expansion of urban areas on or nearby aquifer systems that are being exploited. This will encourages me to consider such consequence in groundwater management.

IV. Acknowledment

This field were conducted with the help of different counterparts, collaborators and volonteer Thai students from Chulalongkorn University. Therefore we remain grateful to all those individuals who brought their contributions in order for us to fulfill the oversea field trainin in Thailand.

Our acknowledment are also addressed to Assistant Professor Aksara Putthividhya, from the Department of Water Resources Engineering of Chulalongkorn University, and all her students and individuals that she brought to our support during our stay in Bangkok.

The member of the Department of Groundwater Resources of Thailand had the most critical role to play in our training and for that we express our profound gratefulness to them for all they did.

We aslo remain contantly grateful to FOLENS program and all its faculty members for having facilitated the fulfillment of our field trip financially as well as accademically and morally..

I'm personally grateful to my supervisors, to Associate Professor AKSARA and her students; and to FOLENS program for Between 2013/11/25 and 2013/11/29 we have conducted a field training in Bangkok, Thailand. The objective was to investigate one aspect of the groundwater of the aquifer complex in Bangkok. In situ measurements of electro-conductivity (EC) and temperature were done from 14 locations wells. These

measurements targeted 3 superposed aquifers identified by the code names, from top to bottom, by PD, NL and NB. Salinity maps constructed from the measured EC values showed that the aquifer NB has the best water quality (salinity mostly lower than 0.9 g/L); while the shallowest aquifer (PD) displayed a low water quality compared to others,(up to 2.05 g/L as salinity value on the investigated area). Aquifer NL, intercalated between the 2 mentioned above, has lower quality than NB (located below it) but seems have a better water quality than the aquifer PD (located above it). However this aquifer NL has salinity value often greater than 1.0 g/L. This shows that the deeper the aquifer the better is its water quality. It also indicated that the groundwater depletion occurred in the shallowest aquifer and that the seawater intrusion started to take place as if it was submerging the underlying aquifers.

all their supports and assistance.

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(Supervised by Professor Yuji KOHGO)

Report of Overseas Field Training
FOLENS Program
Tokyo University of Agriculture and Technology

Agricultural Soil Characteristics and Farmers' Livelihood Situations in Cambodia

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Graduate School of Agriculture
Cambodia: 22 January-05 February 2014

Key words: deforestation, agroforestry, eco-village, traditional textiles, soil amendment

Abstract

Overseas Field Training was conducted from 22 January to 05 February 2014 in Cambodia. The main purpose was to investigate soil characteristics by real time investigation on the field, to understand several problems for farmers' economy and sustainability, and to identify important roles of rural development projects such as Run Taek Eco-village and Institute for Khmer Traditional Textiles (IKTT) for people' livelihoods. Through the training, I could enhance the collaboration and network with specialists or key persons from various disciplines and institutes. I firstly visited RUA to start a plot experiment and demonstrate to students the methods of real time investigation. Through these activities, we could enhance our relationship among researchers. We visited land concessions in Preah Vihear and Kompong Thom Provinces to understand soil characteristics after deforestation. The soil in the black pepper gardens showed low permeability; therefore, drip irrigation was recommended to avoid root rot and develop root growth. Additionally, soil samples were also collected to analyze soil texture and hardness by real time diagnosis using portable equipment. We visited Siem Reap Province to understand different traditional livelihoods and surrounding environment, such as agriculture, traditional textiles manufacture, archaeological sites and local markets. Since a lot of tourists visit Siem Reap, more farmers can be involved in the production of the eco-village, Institute for Khmer Traditional Textiles, and archeological sites.

To summarize, these activities were useful to get more ideas, to exchange new visions, and to understand current problems for reducing the future risk. I could enhance my professional network in Cambodia and improve more skills to be a leader in the environmental sector. I will spread the achievements to other people through teachings, publications, and extensions.

(1) Contents and activities during the overseas field training

Title: Agricultural Soil Characteristics and Farmers' Livelihood Situations in Cambodia

1. From 23 to 26 January 2014 at Royal University of Agriculture (RUA) under facilitation of and support from Prof. OIKAWA Yosei, Supervisor, Prof. NGO Bunthan, Rector of RUA, Prof. KANG Kresna, Dean of Faculty of Agricultural Engineering, Prof. CHOUNG Sophal, Dean of Faculty of Agronomy, and RUA's students, the experimental plots were created by applying local materials from agricultural residues namely: rice husk and *Cromolaena odotara* as soil amendments. Soil samples were collected and brought to TUAT with permission from Yokohama Plant Protection Station. Applying charcoal of rice husk and *C. odotara* is a very simple method and very low cost. It is convenient for farmers since they can obtain it from agricultural wastes. These materials improve soil characteristics and help to prevent diseases that occur by fungi. Those have also many advantages for environmental management by reducing carbon emission, capturing nitrogen in the soil, reducing solid wastes from agriculture, omitting bad smell, and so on. Better quality charcoal is suitable for smokeless cooking. The sources are not from natural forests but from solid wastes.

   Many problems impact on farmers' agricultural income. Most soils in Cambodia are characterized as poor acid soil with high risk of disease infection; however, farmers are lacking appropriate technologies for making organic fertilizers. Agricultural markets cannot compete with imported products. Thus, biochar from rice husk and *C. odotara* are a solution that is easy for farmers to produce and apply for soil amendments. Then, market should be created for farmers who participate in organic markets or "one village one product."
2. On 27 January, 2014 at Sunway Hotel, Phnom Penh, under facilitation of and support from Prof. NGO Bunthan, I joined a workshop on Applying Biochar Production on Agricultural Crops cooperated between Department of Agricultural Engineering, MAFF-Cambodia, and Kansai Corporation, Ltd., Japan. Experts showed the results of research projects and transferring experiences on biochar producing and applying on agricultural crops in Japan.
3. On 28 January, 2014 in an agricultural land concession of Try Pheap Export-Import Co. Ltd., in PreahPreah Vihear Province, under facilitation of and support from Prof. OIKAWA Yosei, Mr. Ouk Kimsan and Mr. AN Dara, IEAS alumni, a field visit was organized to understand soil characteristics and crop growing after deforestation. The soil was so hard and characterized by sandy loam soil or silt sandy loam. The soil permeability was low so that it was very difficult to drain water. This situation causes water logging and disease infections and results in low agricultural production. Watering systems in the area were drip and spread irrigation systems. We observed the soil characteristics, drip irrigation seemed to be more efficient than sprinkler irrigation since drip irrigation can save water and permit water very slowly while it can avoid water logging and nutrient leaching from the top soil, and also conserve the ground water quality. Particularly, the former forest reserve was converted into concession areas for agro-business (rubber and pepper plantations).Without surveys on biodiversity, the forest ecosystem was destroyed or replaced with a new agro-ecosystem. A large area for wildlife habitat was lost., and the forest vegetation holding soil and water was removed or burnt. I worry about

land aridification or soil salinization and erosion, and global warming or flooding. In the end, it is leading to loss of an important symbol of the country, biodiversity. However, if agro-business follows the concepts of sustainable development, it will be benefit for the country's economy.

4. From 01 January to 04 February, 2014 at Siem Ream Province, under facilitation of and support from Prof. OIKAWA Yosei; Prof, TANAKA Haruo, Sub-supervisor; Mr. MORIMOTO Kikuo, Head of Institute of Khmer Traditional Textiles (IKTT); and Mr. Keat Pengkeng, Assistant of Project Manager of APSARA Authority, the studies were conducted through visiting:
    - Run Taek Eco-village in Tani Village, Run Taek Commune, Banteay Srey District: In the place, farmers were settled as a group to support agricultural development. The farm soil was being improved with organic fertilizers, but original soil was infertile and needed to apply all the area with organic fertilizers to improve soil property and crop production. The area was surrounded by crop fields, bush lands, and grazing lands. It was located close to the archeological and tourist areas. If the eco-village is really developed for eco-tourists, it will give farmers benefits for both environment and livelihood with sustainable development.
    - Angkor Ceramic Museum at Tani Village. The archeological site had a very old historical kiln site that can attract people to visit and research. It can be a good place for starting agricultural practices with traditional culture and biodiversity conservation[YO1].
    - Institute for Khmer Traditional Textiles (IKTT): Mr. MORIMOTO has been developing traditional Khmer Textiles for almost 20 years by encouraging local people to learn traditional silk production and weaving. Although technology of Khmer traditional textiles has been almost lost from Cambodia, the members of IKTT have revived the production. Planting mulberries for silkworm through enriching soil fertility by applying cattle manure was a main agricultural production for sustaining Cambodian traditional sericulture and textile manufacture. The project has given local people many advantages such as extra income and skill. Even small children are encouraged to learn our traditional lifestyle and a way of improving farmers' livelihood. From the ancient time, this place has been our traditional textile region that can attract tourists to visit and study. IKTT will always keep our important symbol of Khmer textile for the next generations. Beside the place of the textile production located in the remote area, there was also a shop for selling the products located in the provincial city. It was very interested that this job has been promoted not only for business, but also for encouraging the surrounding environment with sustainability.
    - Artisan Angkor under French project; they have also been trying to promote Cambodian traditional textiles as well as to improve farmers' livelihoods.
    - Agricultural markets that are essential for all farmers to sell their products after harvesting. Meanwhile, there was one restaurant that always served the organic and fresh products. It is not easy to produce organic vegetables and we need high cost in production if compare to conventionally grown vegetables. To find low cost organic agriculture is a core solution

for sustainable development.

5. On 04 February, 2014 at Preah Vihear Province under facilitation of and support from Prof. OIKAWA Yosei, Prof. TANAKA Haruo, Mr. Ouk Kimsan and Mr. AN Dara, a soil survey was conducted at several places of the area. Soil profiling, soil sampling, observations of water loggings, nutrient deficiencies of crops, and water irrigation systems were instructed by Prof. Tanaka. Environmental conservation by reducing chemical inputs and developing more appropriate-agricultural techniques should be done for saving water, applying crop rotation and mixed-cropping, improving soil fertilities with organic fertilizers and rice husk charcoal.
6. On 05 February, 2014 at RUA under facilitation of and support from Prof. OIKAWA Yosei, Prof. TANAKA Haruo, Prof. NGO Bunthan, Prof. CHOUNG Sophal, Prof. Lor Lytor, Vice Director of Graduated School, the real-time investigation on soil and crop nutrients was demonstrated to students of Agronomy Faculty. we provided them with pH and EC meters, a nitrate meter, a calorimeter, and a poket scale . These equipments are very helpful for laboratory experiment in RUA. [YO2]It is difficult to buy any equipment for students. Participants could exchange new visions for enhancing students' capacity.
7. On 05 February, 2014 at Department of Agricultural Engineering under facilitation of and support from Prof. OIKAWA Yosei, Prof. TANAKA Haruo, Prof. NGO Bunthan, and Mr. Chan Saruth, Director of Department of Agricultural Engineering, we observed different kinds of biochar stoves, crop production and soil characteristics after rice husk biochar application. Biochar was efficient to improve crop growth and soil fertilities. If the center works for extension to farmers, biochar application will be more popular soon due to many benefits for agricultural production and environment.

Biochar or other organic fertilizers have been spread into Japan since a long time ago. Rice husk biochar was officially approved as a soil amendment in Japan in 1984. Fertilizer markets are almost everywhere; therefore, farmers can easily find it. In contrast, it is very rare to find fertilizer markets in Cambodia, and biochar has just started to spread.

(2) Findings and achievements obtained, significant experiences and lessons

Through this practical oversea field training, I could prepared successfully my biochar-plot experiments and field investigations in many different areas within Cambodia. It was very fruitful because I got many advices, comments and supports from many professors and friends who have various majors both experiment and field surveys. Many lessons were learnt for conducting soil experiments, understanding environmental and social issues, finding solutions based on sustainable development and enjoying the situation with people. In addition, I joined a group working with other students to accomplish my field experiments and field surveys in Cambodia. I obtained extra knowledge about real time investigations that can identify immediately on the field. Its experimental procedures were different from those of the experiments in the lab. In the lab, it takes much time to accomplish. Importantly, I could understand more about soil science, degraded environment, water-saving irrigation systems, appropriate fertilizers, and soil amendments with direct handling on the field. It was more useful than learning only from the theories.

Indeed, I could understand some Cambodian soil characteristics that are essential for my research, and I could use it as the data for my thesis as well. In addition to this, the knowledge derived from the outside of university such as farmers and companies are very necessary to learn and to exchange a new approach that can be a participatory research. We can easily understand all the situations that need to be involved. Furthermore, I could understand very deeply my research on what I have never dealt with before, it was interesting archeological places of my country, but contrastingly, I was never interested to involve it to my research. Thus, understanding the situations around our research is also needed to get more solutions and to make the interactions with different fields for the future researches.

Through this training, I could gain not only　research data but also g more networks from different disciplines such as universities, departments, local and international NGOs, and companies. The most important was that planning and making a decision should be done and changed flexibly according to the situations. For instance, I did not prepare the raw materials for my experiment like *Chromolaena odorata* before my schedule to Cambodia because I thought it was easy to find everywhere, in contrast, when I arrived in Cambodia, I knew that it was very difficult to find it in dry season.

To conclude, Overseas Field Training was really better than my previous experiences because I could experience many different research activities with different people who had different majors and came from different institutions. Sometimes, I could meet people from senior institutions including the government, NGOs, and companies. Ordinarily, I cannot talk with such people. In particular, I could visit many interesting places where I would be able to apply new experiences for my current research and future research. I got different comments and recommendations; therefore, my opinion about sustainable development was sometimes changed by new experiences under different times and situations. These significant comments and recommendations stimulated me to gain more knowledge and strengthened me to be a good coordinator in communications and networks.

(3) Achievements and its future vision

Overseas Field Training provided me with many advantages to understand people' living situations related to current agricultural issues and to think better solutions for farmers. I will be involved in my current research about biochar for improving soil fertility in the future. Biochar is one of useful materials for my country to sustain people' livelihoods and conserve the environment. I would love to learn the theory of eco-tourism to serve more income for people living around the area, and apply it for reducing input[YO3]s in sustainable development　attracting tourists, and love to enjoy hand making with farmers. I believe this approach can promote agricultural sustainability in a whole country. I hope to work as a lecturer who can transfer this knowledge to students, and to introduce them the lessons I learned, the problems I faced, and the possible solutions. I would love to combine new generations into different study groups according to environmental situations, and exchange former and new ideas. I would like to work with farmers in the remote areas by developing my research project on biochar amendment, and convert it[YO4] into an agroforestry project. Then I will organize a farmers' group to promote organic vegetable markets or "one product, one village". What is more, I would like to create networks and always keep good communications

with the key actors who are very important to realize the plan and process. One project should involve with the government, local and international NGOs, universities, former and future researchers who have different visions. Then, we will be able to know all the problems and benefits to avoid risks or failures in the future.

(4) Acknowledgements

- I am very delighted to have supervisor and sub-supervisor along with my trip. I would like to profound thanks and gratitude to **Prof. OIKAWA Yosei**, **Supervisor**, for his valuable time, supports, recommendations and comments, especially his kindness and encouragement for my both research and non-research matters.
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(Supervised by Prof. OIKAWA Yosei)

6-6. インターンシップ / Internship

本プログラムでは、実際に現場で行われている取り組みを自らの経験として理解することを重視し、国内外の NGO/NPO、企業、研究機関等におけるインターンシップを取り入れてきました。

履修学生の専攻分野や研究的・職業的関心は多岐に渡り、インターンシップのテーマや研修先については幅広いニーズがあるため、本プログラムとしては、各学生の主体的な計画、準備を促すとともに、必要に応じて綿密な相談や情報提供を重ねながら、現場立脚型環境リーダーとして活躍する将来につながるテーマ・研修先の設定や、事後のふりかえりを支援してきました。受入機関のご理解、ご協力に支えられ、下記のとおり多様な活動が実現しています。

Internship is another important component of the FOLENS Program. It provides an opportunity for students to understand the activities of a real society through actual experience.

Hosts for FOLENS internship activities include non-governmental/non-profit organizations, companies, and research institutes both in Japan and abroad. FOLENS students have a variety of backgrounds and interests and FOLENS has encouraged and supported each of them to take their own initiative and to plan and prepare for internship activities that match their individual needs. With careful consultation and information provision by FOLENS faculty, students have clarified a theme, identified a host, and reviewed their activities according to their vision for the future as a field-oriented environmental leader.

Below is a list of internship activities that have been realized under the FOLENS program, with great support by a variety of hosts.

2011～2013 年度インターンシップ実施一覧（2010 年度は実施なし）

氏名	国籍	期間	派遣先	テーマ
ゴビンダ・ナラヤン・ティミルシナ	ネパール	2011/4/25-11/7	パラダイスガーデン＆ファーム（米国）	持続可能な農業～山羊飼育、牧場管理、チーズ加工、再生可能エネルギー
カトレア・チャッテアン	タイ	2011/8/23-11/22	米国農務省農業研究事業団植物科学研究ユニット（米国）	天然・農作植物に対する大気汚染の影響
ナーゲン・パトムラック	タイ			
花田修明	日本	2011/10/17-11/11	いであ株式会社国土環境研究所環境技術部（横浜市）	環境アセスメント・コンサルティング業務体験
南琇娟	韓国	2011/11/7-12/10	米国環境保護庁研究開発オフィス（米国）	研究チームの組織・運営、河川の生物地球化学とキャッチメント・モデリング

周東 直毅	日本	2012/1/14-3/10	環境NGOイカオ・アコ事業サイト（フィリピン・シライ市）	途上国の森林問題に関する国際協力NGOの取組～マングローブ林再生プロジェクト
青井一洋	日本	2012/2/14-5/14	農工大JICA草の根技術協力事業サイト（フエ大学・バックマー国立公園）（ベトナム）	小規模（ベトナム中部）・大規模（メコンデルタ）稲作における農業資源削減方策
アウン・ゾー・ウー	ミャンマー	2012/5/15-7/10	NPO法人ブリッジエーシアジャパン（BAJ）マウンドー事務所（ミャンマー）	国際協力事業現場への参画（車両・機器類の整備、地元の若者への技術・職業訓練等）
ヨー・ビー・ギョク（メイベリン・ヨー）	マレーシア	2012/7/31-8/21	タンガロア・ブルー（オーストラリア）	プラスチック片と海洋保全～オーストラリアの都市・農山漁村コミュニティにおける意識向上と教育
ピョン・ウィン ウィン	ミャンマー	2012/8/16-8/24	農業工学研究所（筑波）	環境地質工学に関する研究テーマ・モデルテスト
阿部ちひろ	日本	2012/9/3-10/16	ベトナム・ボランティアーズ・フォー・ピース／国際文化青年交換連盟日本委員会（ベトナム）	今日のベトナム～ベトナム戦争の経験（枯葉剤による被害児の施設での有機農業作業等）
棚澤 理奈	日本	2012/9/6-9/26	公共財団法人オイスカ 事業サイト（フィジー）	NGOによる環境分野の国際協力～沿岸部環境保全・農村開発
迎 春	中国（内モンゴル）	2013/3/28-6/25	コンサベーション・オーストラリア（オーストラリア）	健やかで持続可能な環境のためのボランティア～環境と遺産を守る
大倉　芙美	日本	2013/4/10-9/30	ナレスアン大学再生可能エネルギー技術学部（タイ）	タイにおけるプロジェクト管理～農村コミュニティ・エネルギー・プロジェクト
山村　理奈	日本	2013/5/27-29, 8/6-19	カセサート大学林学部・東京大学・京都大学　森林試験地（タイ）	日本とタイの森林試験地における二酸化炭素fluxと蒸発散量の測定・管理システム
ポヤ・グラム・ホッサイン	アフガニスタン	2013/8/9-9/13	ワイルドライフ・コンサーベション・ソサイエティ（アフガニスタン）	アフガニスタンにおける国際NGOによる環境教育・キャパシティビルディング
オマリ・リチャード・アンソン	ガーナ	2013/8/30-11/1	米国コーネル大学　コーネル・ソいる・ヘルス・センター	土壌の健全性とマネジメントアプローチに関する活動
渡井　千絵	日本	2013/9/12-10/2	公共財団法人オイスカ 事業サイト（フィジー）	フィジーにおける環境問題に対するアプローチ
田畑　聡美	日本	2013/10/23-11/22	国際稲研究所	水田の水管理と水質に関する研究
八木岡　敦	日本 Japan	2013/11/26-	国際半乾燥熱帯作物研究所（イン	ソルガム生産のための持続可能な

		12/7	ド）	土壌肥培管理開発
ハディアン・ペルマナ	インドネシア	2014/2/12-2/21	キーコーヒー株式会社	母国と関係を持つ日本企業のあり方、保管条件によるコーヒーへの影響に関する検証

List of Internship Activities in Academic Year 2011-2013 (There was no internship conducted in AY 2010)

Name	Nationality	Duration	Host Organization	Theme
Govinda Narayan Timilsina	Napal	2011/4/25-11/7	Paradise Gardens and Farm LLC (USA)	Sustainable farming – goat dairy farming, farm management, cheese production, and renewable energy
Cattleya Chutteang	Thailand	2011/8/23-11/22	USDA-ARS Plant Science Research Unit, NC State University (USA)	Impact of aerial pollution on wild and agricultural plants
Na-ngern Prathomrak	Thailand			
HANATA Nobuaki	Japan	2011/10/17-11/11	IDEA Consultants, Inc (Yokohama, Japan)	Work at an environmental assessment and consulting firm
NAM Sooyoun	South Korea	2011/11/7-12/10	U.S. EPA, ORD, National Exposure Research Lab. (USA)	Management and operation of a research team/ Stream biogeochemistry and catchment modeling
SHUTO Naotaka	Japan	2012/1/14-3/10	Environmental NGO Ikaw-Ako Project Site (Silay City, Philippines)	Initiative by an international cooperation NGO for forest issues in a developed county – Mangrove reforestation project
AOI Kazuhiro	Japan	2012/2/14-5/14	TUAT-JICA Partnership Program “Bach Ma Charcoal Project” (Bach Ma National Park, Hue University, Vietnam）	The Strategy of saving farming resources in rice cultivation in small-scale (Central Vietnam) and large-scale field (Mekong Delta)
Aung Zao Oo	Myanmar	2012/5/15-7/10	Bridge Asia Japan (BAJ) Maungdaw Office (Myanmar)	Participation in an international cooperation project site – maintenance of vehicles and machineries, training for youth etc.)
YEO Bee Geok (Maybelline Yeo)	Malaysia	2012/7/31-8/21	Tangaroa Blue (Australia)	Marine debris and conservation: Raising awareness and education in urban and rural communities in Queensland, Australia

PYONE Win Win	Myanmar	2012/8/16-8/24	National Agriculture and Food Research Organization (NARO) (Japan)	Study on a model test about the stability of slopes against rainfalls
ABE Chihiro	Japan	2012/9/3-10/16	Vietnam Volunteers for Peace Vietnam/ ICYE Japan	Vietnam today, with experience of The Vietnam War
KURUMISAWA Rina	Japan	2012/9/6-9/26	OISCA International, Fiji Project Office (Fiji)	International cooperation in an environmental sector by NGO
Ying Chun	China (Inner Mongolia)	2013/3/28-6/25	Conservation Australia (Australia)	Volunteer work for healthy and sustainable environment – Conserving the environment and heritages
OKURA Fumi	Japan	2013/4/10-9/30	School of renewable energy technology, Naresuan university (Thailand)	Project management in Thailand – Rural community energy project
YAMAMURA Rina	Japan	2013/5/27-29, 8/6-19	Faculty of Forestry, Kasetsart University in Thailand, Tokyo university, and Kyoto university	Management system of CO2 and H2O flux measurement in Kiryu (Japan), KogMa and MaeMo (Thailand) experimental forest
Poya Ghulam Hussain	Afghanistan	2013/8/9-9/13	Wildlife Conservation Society (Afghanistan)	Environmental education and capacity building by an international NGO in Afghanistan
Omari Richard Ansong	Ghana	2013/8/30-11/1	Cornell Soil Health Center (USA)	Soil Health And Management Approaches
WATAI Chie	Japan	2013/9/12-10/2	OISCA International, Fiji Project Office (Fiji)	The approach and attitude toward environmental issues on Fiji
TABATA Satomi	Japan	2013/10/23-11/22	International Rice Research Institute (IRRI) (Philippines)	Study on water management and quality in paddy field
YAGIOKA Atsushi	Japan	2013/11/26-12/7	International Crops Research Institute for Semi-Arid Tropics (ICRISAT) (India)	Developing sustainable soil fertility management through effective use of biological nitrification inhibition (BNI) for sorghum production
Hadian Permana	Indonesia	2014/2/12-2/21	Key Coffee INC. (Japan)	Experiencing a Japanese company that has business in Indonesia/ Analysis of impact of storage conditions on coffee

Report of Internship Training
FOLENS Program
Tokyo University of Agriculture and Technology

Dairy Internship at Paradise Gardens and Farm

Govinda Narayan Timilsina
IEAS

Introduction

Internship opportunities provide a useful skill in a particular area in order to enhance performance in one's future career. My internship was a kind of apprenticeship. There are lots of things that need to be done before you choose a certain profession as your career. A good apprenticeship or internship provides an excellent platform, whereby the apprentice performs the day-to-day work through which he or she learns and practices how to perform a particular job in the proper way for the future.

I am Govinda Narayan, a native of Nepal. My future goal is to become a social entrepreneur by being an organic goat farmer in the foot hills of the Himalayas. That is my dream. But having a dream and achieving that dream, in most cases, are two very different things. An academic institute or training center helps to bridge that gap by providing knowledge and skills. The reason I entered Tokyo University of Agriculture and Technology was to equip myself with a basic know-how of farming, and to gain an understanding of how to implement rural development in a sustainable way. One of my objectives was to gain first-hand knowledge of the interrelationship between the environment and agriculture. This is why I chose FOLENS, due to its relevant curriculum and internship opportunities.

My FOLENS internship, which lasted two years, provided me with basic knowledge about environmental degradation and how to protect and preserve the environment. Through discussion opportunities, class work and workshops, the organization helped me to grasp the prerequisite knowledge in this field. It also provided me with the opportunity to work on a dairy farm called Paradise Gardens and Farm LLC, in Pennsylvania, USA.

My mentor and the owner of the farm, Stephen Cleghorn, leading the goats on a rainy day. I can be seen on the far right. (Photo: *Pittsburgh Tribune-Review*)

Paradise Gardens and Farm LLC is an organic farm, spreading over 53 acres of land, with about 5 acres of organic garden within it. The creamery is the main business of the farm. The farm has 32 milking goats and more than 50 hens and roosters. The farm was established as a training center for youth who want to become farmers, as well as providing a model, in concept and practice, of environmental friendliness through sustainable farming. Paradise Gardens and Farm is also an eco-friendly farm, which runs its dairy by solar energy

As mentioned earlier, I am looking forward to my career in organic goat farming, which will be based on environmentally friendly principles and the sustainable utilization of local resources. The internship consisted of different learning and practical opportunities.

Activities during the internship

During the internship I learnt and practiced how to milk the goats using inflation, which was my first lesson. I woke up at 5 am in the morning and milked the goats, which usually took 2 hours. After milking, pasteurization had to be done; this usually gets inspected every 3 months by an authorized person. I learnt to perform, almost error free, the operation of milk pasteurization procedures and record keeping. One of the other main tasks of my internship was to make artisan cheese which, is farmstead cheese. It was a delicate job, which required fastidious work, hygiene control skills, culinary art (you have to know about the peculiar taste of natural cheese), and patience. Chèvre and feta are two kinds of cheese I learnt to make, which was very useful as well as a fantastic experience. I also made yogurt and bottled goat milk. Along with daily chores, I became familiar with the solar energy system, which provides electricity to the dairy. Surplus solar energy generated by the farm used to be sold by sending it to the main electricity grid.

Lucinda Hart-Gonzalez and I posing for the *Pittsburgh Tribune-Review* in the dairy with our products. (Photo: Pittsburgh Tribune- Review)

Besides working in the creamery, I learnt how to feed and take care of goats. The goat is a pretty animal, which is sensitive and smart. However, just like other domestic animals they are prone to disease, which is mainly transferred through their feed − in other words, grass. Therefore, to control the spread of diseases I learnt how to take preventive measures to keep them healthy. Cleaning the barn was one of my jobs. Checking the behavior of the goats to detect possible symptoms of injury or infection was also routine work.

In Nepal, top-soil erosion is a prominent environmental problem due to overgrazing in hilly areas, as well as in the plains areas of the country. Realizing the potential threat from such animal grazing, Paradise Gardens and Farm has implemented a rotational grazing system, which not only minimizes top-soil erosion but also minimizes the risk of spreading parasites. I had an opportunity to learn and observe these practices. Rotational grazing was traditionally used in Nepal, but this is not the case nowadays.

Stephen and I at the Farmer's Market in Pittsburgh, selling our products. (Photo: Yuka Timilsina)

Sales is the most challenging job for most small scale-farmers, because of their relatively low volume of sales and inability to compete with large-scale producers. Paradise Gardens and Farm provided me with an outstanding opportunity to market its products through two areas of marketing activities: direct sales, and supplies to department stores and brokers. I was taught how to display the products at the Farmers' Market at Pittsburgh, and the company also provided me with the opportunity to maintain relationships with its main clients. During my term at the farm, I devised and implemented a new approach involving a price incentive marketing strategy, and cost efficient operation and handling techniques.

Experience and Achievements

Besides all the other skills and lessons, I learnt that understanding human relations in any organization counts for a lot. The success or failure of every organization is mostly based on co-ordination and co-operation among its staff, because their work and talents propel and shape the organization. Based on my internship experience, I learnt that this is a key factor in operating an organization. Other than that, techniques for animal keeping and the proper care of them was the most useful experience. Working at the creamery enabled me to make cheeses and sell them at the market.

If I had to pick my main achievements from doing the internship, however, I would have to say it was public relation building and generating knowledge assets, mainly entrepreneurial skills. Learning how human beings, animals and other organic materials share the earth and how to improve their inter-relationships has been a challenging task in environmental, agricultural and other sectors. After being at the farm for 6 months, I have gained an idea of how to manage it on a small scale.

One of the rewarding experiences of my work at Paradise Gardens and Farm was when the *Pittsburgh Tribune-Review* published a cover story on the farm and my work in its May 31, 2011 issue.

Relationship to future career development as a field-oriented leader in Asia and Africa

As I mentioned earlier, I am going to be an organic farmer. Nepal, where I come from, is a mountainous country, including the Himalayas. Every year monsoon brings havoc in the form of rising rivers and landslides. Every year many people lose their lives, family and property, and most of them are poor farmers: ridiculously, in this world most of the poor are farmers.

In search of knowledge to eradicate poverty among farmers and to take the necessary initiatives for controlling environmental degradation, I entered Tokyo University of Agriculture and Technology with some anticipation of discovering measures to fight against such environmental degradation in the foot hills of the Himalayas. I learnt that overpopulation need much food to sustain, which eventually impact on overpopulation of domestic animals due to rise of food demand. Severe environmental damage often occurs as a consequence of over-exploitation of natural resources. Thus, to ensure the sustainable utilization of those resources, it is important to run a farm − or any other type of human activity − sustainably. In the future, I, with the support of local people, would like to take the initiative by operating a goat farm in an environmental friendly way, which in the long run will have the potential to become a local institute for needy farmers who wish to maximize the benefits of the available resources without any harm to the sustainability of those resources.

To conclude, I would like to convey my sincere thanks to FOLENS as well as its contributors. I am also indebted to Paradise Gardens and Farm for providing me with such a useful opportunity for an internship.

Report of Internship Training
FOLENS Program
Tokyo University of Agriculture and Technology

A Study of Air Pollution and Crop Physiology in the USDA Plant Science Research Unit, NC State University

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Department of International Environmental Agricultural Science
Graduate School of Agriculture

Key words: ozone, air pollution, soybean, photosynthesis, chlorophyll fluorescence

1. Contents and activities during the internship

1.1) Internship: location and general information (Figure 1)

I carried out my FOLENS internship at the USDA (United State Division of Agriculture) Plant Science Research unit, North Carolina State University, in Raleigh, USA. This organization is very interesting, and it is a peaceful place to carry out research. Professor Dr. Fitzgerald Booker is head of the Plant Science Research Laboratory, which specializes in soybean physiology and ozone stress in plants. He helped to greatly increase my knowledge in this area.

My internship ran from 23 August to 21 November 2011. During this internship period the seasons changed from summer in late August to fall in November. As indicated in the title of my internship, I wanted to study air pollution, and meteorology is an important factor in this. It was therefore a good chance to study and experience the seasons and weather changing on the American continent. In addition to the seasonal changes, there was an extreme weather event in the form of Hurricane Irene. Irene hit the town of Raleigh, mainly on the coastal side, in late August 2011, which was the first week of my internship. That was one of the most significant experiences of my student life.

1.2) Activities during the internship (Figure 2)

I. Photosynthesis and chlorophyll fluorescence

Currently, the effects on agricultural production of global environmental problems such as water, soil and air pollution are much discussed. Agriculture plays an important role in providing food for an increasing world population. One of the main methods for estimating the efficiency of crop yield is photosynthesis measurement and chlorophyll fluorescence, using the LI-6400XT machine.

In this internship I studied the effect of ozone (O_3) on the photosynthetic efficiency of two genotypes of soybeans. The objectives of this research were to study the photosynthetic physiology and chlorophyll fluorescence of soybean plants exposed to an O_3 environment, and to see whether the ethylene-producing inhibitor 1-MCP (1-methylcyclopropane) can mitigate the negative effects of O_3. I transplanted two

genotypes of American soybean plants, the cultivars *Fiskeyby* (an ozone-tolerant genotype) and *Mandarin Ottawa* (an ozone-sensitive genotype), during the first period of my internship. These soybean plants were fumigated with O_3 in the plant growth chamber of a greenhouse, and 1-MCP was applied using a spray technique at a suitable time. After this, I measured photosynthesis physiology and chlorophyll fluorescence using an LI-6400XT machine.

During my work, with supervision from and the support of USDA plant researchers, I received a lot of new ideas by sharing knowledge with them. For example, I had the opportunity to work with one of the soybean researchers, Dr. Erin Silva, who taught me how to operate the LI-6400XT machine. I was able to study it and take real measurements, both outside and inside the laboratory. As a result, during this internship I learned a lot and applied this knowledge to improve my skills. I absorbed as much as I could in order to improve my career and to be a good environmental leader in the near future.

II. Atmospheric peroxide measurement

As global warming shows, human activities can influence climate processes, generate many pollutants and destroy valuable natural resources. One of the big global environmental problems is air pollution. Many air pollutants such as O_3, sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_X) and volatile organic compounds (VOCs) are emitted by human activities and affect the environment. Moreover, the new and unfamiliar class of air pollutants, the peroxides, are ubiquitous in nature because they are a primary end product of free-radical reactions involving oxygen and water. The simplest stable peroxides are hydrogen peroxide, superoxide and dioxygenyls. Some research has revealed that peroxide is very harmful to plants when combined with O_3, but there is still a lack of basic information and studies in this area.

In this internship, my coordinator and I started to monitor peroxide concentrations in the atmosphere of Raleigh, NC, USA. In order to collect the samples of atmospheric peroxides, meteorological data and atmospheric O_3 concentrations were necessary in order to interpret the concentrations of atmospheric peroxides. Professor Dr. Fitzgerald Booker and the scientific technician helped us to set up the atmospheric O_3 and peroxides measurement column near our internship work site. Every second week the peroxides sample solutions were collected five times per day, 4 days continuously. These solutions were analyzed using an RQflex10 machine to measure the atmospheric peroxides concentration. The results showed that the concentrations of atmospheric peroxides can be expected to increase in the near future.

III. Plant biochemical analysis techniques

In order to carry out in-depth study of plants' responses to physiological stress, knowledge of and techniques relating to plant biochemistry are very important. When crops experience stress in the environment (in this case, O_3 in the atmosphere), this stress leads to a decline in crop yield. Combined with air pollutants, which are still increasing globally, the result is many negative impacts on agricultural production and the environment (for example, biodiversity loss, forest decline and acid rain).

One of the best ways to see how plants respond metabolically to stress is to use plant biochemical techniques. In this internship I learned the basics of plant biochemistry analytical techniques for ethylene (C_2H_4), peroxides in plant cells, and dimethylamino-fluorene (DAF). These parameters can be used to determine the growth and response of plants under air pollution stress. For example, C_2H_4 analysis is used to determine the amount of C_2H_4 released from soybean leaves, using gas chromatography (GC). Plant physiologists usually consider C_2H_4 to be one of the plant hormones that can be used to estimate the stress on plants. Unlike other plant hormones, C_2H_4 is a volatile gas that is readily given off to the atmosphere. I gained not only knowledge of C_2H_4 analysis but also the practical techniques for using the GC machine.

IV. Other activities (Figure 3)

During my internship period, along with laboratory work I also enjoyed a number of other activities. For example, I went to the United States Botanic Garden in Washington, DC, which has a huge variety of native and exotic plant species. There are many plant greenhouses there, which are used to display various kinds of plants from a plant ecology point of view. For example, the desert plants greenhouse had many species of cactus and succulent plants; the primeval plants greenhouse displayed the lower vascular plants such as mosses, ferns and cycads; and the rare and endangered species plant greenhouse gave information about the endangered plant species in America, and also propagated and grew them in order to increase their population.

I also went to the NC state fair, which was held during my internship period. It was very interesting. The NC state fair is held once a year to present innovations and products relating to agriculture and technology in NC state. There were many activities and different kinds of exhibits; for example, there was a soil and water conservation exhibit, where people could talk to soil and water specialists in order to learn more about the importance of soil and the soil ecosystem. The NC Forest Service exhibit focused on explaining how to help keep the forests alive and well, and was giving away tree seedlings to people to enhance tree distribution.

Finally, I visited many interesting places located not far from my work place, such as museums, a traditional farmer market and the local natural park.

2. Experiences and achievements gained from the internship

2.1) Scientific experiences and achievements

The USA is a one of the world's leading countries, and the USDA is one of the world's best-known organizations for agricultural production and technology. In this internship I learned a lot about scientific and laboratory work, especially in relation to soybeans, because my internship laboratory focused on soybean production. There are many soybean laboratories at the unit, and each laboratory has a different focus in soybean research. Some laboratories study soybean genetic improvement, some focus on soybean pest control, and others research post-harvest technology for soybeans. Professor Dr. Fitzgerald Booker's laboratory (my host laboratory) mainly researches air pollution, and in particular the effect of O_3 on soybeans. I therefore learned a lot of new theory and practical techniques, which will be very important and useful for conducting and improving my research and my career, because it was all new to me. In this report, I will briefly look at one technique: chlorophyll fluorescence.

Photosynthesis is a necessary part of plants' metabolism in their life cycle. Without this activity, individual plants cannot survive in nature. Plants use sunlight to oxidize water and carbon dioxide (CO_2), thereby forming large carbon compounds (to produce their food starch or sugar) via chlorophylls in the plant's organs, mostly in leaves with a green color. When sunlight shines through plant leaves, one of three things can happen to the light: it may be used in photochemistry; it may be emitted as heat; or the excited chlorophyll may emit a photon and thereby return to its ground state of energy level; this process is called *fluorescence*. Most fluorescence is emitted by chlorophyll *a* of *PhotosystemII* (PSII), which plant physiologists usually call *chlorophyll fluorescence*. Fluorescence increases when photochemistry and/or dissipation are low relative to photon absorption, but the process is not regulated as such. It can occur under conditions of excessive light, a severely limiting CO_2 supply, or *stresses that inhibit photochemistry*. Therefore many parameters of chlorophyll fluorescence are used to estimate the photosynthetic efficiency of

normal plants, and plants that grow under abiotic or biotic stress conditions, as in a high O_3 environment. For example, F_v/F_m, which gives the maximum quantum yield after dark incubation, is typically very stable, with a value of around 0.8 in healthy leaves. My experimental results confirmed that in soybeans that were fumigated with 70 ppbv O_3 in the growth chamber for 4 days continuously, the F_v/F_m value was lower than 0.8 (around 0.5−0.6). This indicates that plants decrease their use of sunlight for photochemistry and release more fluorescence, which implies that O_3 pollution can effectively decrease the photosynthetic ability of soybeans within a short period.

2.2) Intercultural experiences and achievements

Everybody knows that American culture is different from Asian culture, including the language, foods, traditions, manners and social relations. During this internship I learned a lot about American ways of life. One of the important things I learned from this internship related to the organization and management of daily working life. Because the USDA is one of the science offices, every officer has to work on weekdays from 9:00 to 17:00. This wa

the first time I had worked in a government office with plant researchers, and I learned that responsibility and duty are very important things for work. American people mainly stay at work only during work time, which means that after 17:00 on weekdays most officers will return home and continue their work for the next day. This work style seemed very different from the Japanese style, which usually involves working overtime and sometimes also during the holidays.

I also learned about organizational management. Twice I had the opportunity to attend the work project's meeting. I could not understand the details they discussed, but I was able to see how they share their ideas and how they assign and manage the projects.

3. Relationship of the internship experience to future career development as a field-oriented leader in Asia and Africa

The experiences I gained from this internship will influence my way of thinking and will help generate ideas about environmental issues, not only from the plant physiologist's perspective but also from other points of view, such as American children, housekeepers, and also Thai students who study in America. In other words, I shared and exchanged opinions on global environmental topics both inside academic departments and in the wider society. In my opinion, the theory and knowledge we have acquired is still not enough to fulfill today's requirements for society. The world still needs a new and powerful generation in order to heal the environment, and to work to solve issues and develop both society and the environment. This means that real experiences are very important. In my case, I believe that I can use and integrate the valuable experiences I gained from this internship for my future career and become like FOLENs, who have tools (called theories) and power (called experiences and practices). I believe that I can lead and help current global environmental problems using these tools and power. However, in order to be a field-oriented leader, I have to try to use and enhance my skills and share these skills with others in my home country and internationally in the future.

Lastly, I would like to express my gratitude to the Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa, Tokyo University of Agriculture and Technology, for furnishing the internship's scholarship and providing me with the chance to gain a lot of new knowledge and have new experiences, especially relating to air pollution on plant production. My gratitude also extends to Prof., Dr.

Masatoshi AOKI, Prof., Dr. Fitzgerald Booker, the USDA plant science research unit officers in Raleigh, and all the FOLENS staff for recommending and supporting this internship from start to successful completion.

Figure 1

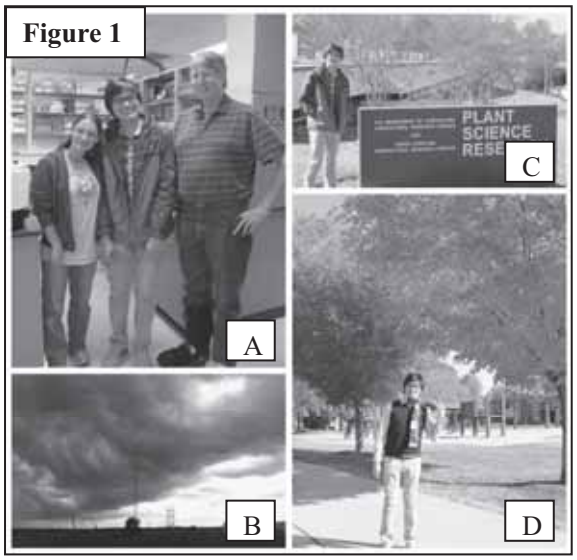

Figure 1
(A) Left to right: Erin Silva (plant physiologist), me, Professor Dr. Fitzgerald Booker; (B) the sky on the evening before Hurricane Irene hit Raleigh; (C) the Plant Science Research unit; (D) autumn in Raleigh.

Figure 2

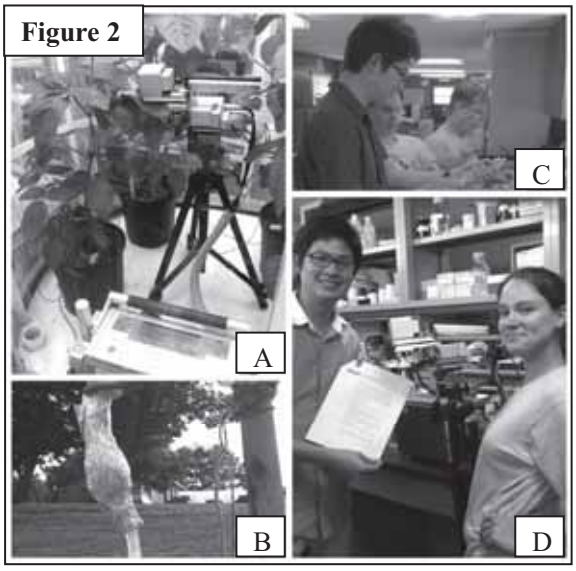

Figure 2
(A) Soybean photosynthesis and chlorophyll fluorescence measurement using an LI-6400XT machine; (B) atmospheric peroxides measurement; (C) plant biochemistry analysis practice; (D) LI-6400XT skill training with Erin Silva.

Figure 3

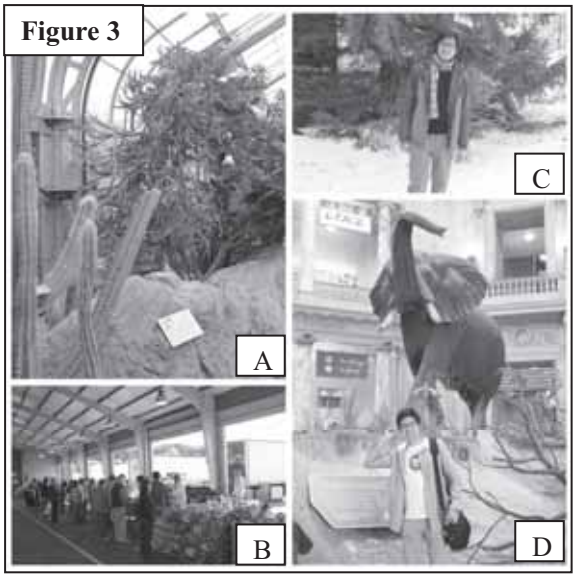

Figure 3
(A) A US Botanical Garden plant greenhouse (desert plants); (B) the farmer market in Raleigh; (C) snow in Minnesota (my transition airport); (D) the Natural History Museum in Washington, DC.

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

The effects of ozone on the biochemical responses of soybeans

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Key words: air pollution, ozone, hydrogen peroxide, biochemical responses, soybeans

1. Activities during the internship

My internship funded by the FOLENS program was carried out from 23 August to 21 November 2010 in cooperation with Dr. Fitzgerald L. Booker and Dr. Kent O. Berkey, Plant Science Research Unit, Agricultural Research Services (ARS), United States Department of Agriculture (USDA), and Department of Crop Science, North Carolina State University (NCSU), Raleigh, North Carolina, USA. Recently, global climate changes and air pollution have been identified as serious global environmental problems; that is, harmful not only to humans but also to natural and agricultural resources. Increasing air pollution, regional changes in temperature, rainfall and light intensity have a tremendous effect on crop growth and can cause severe losses in yields, which may lead to an inability to sustain food production in the future.

Ozone (O_3) is a secondary pollutant that has been reaching high concentrations in the Earth's troposphere. It is considered an important factor among the phytotoxic gaseous air pollutants that may affect crop production and natural resources in the future. Hence the objective of this internship is to study and research the effect of O_3 on crop plants. These effects will be elucidated through study in three areas: (1) the effects of O_3 on the biochemical responses of O_3-tolerant and O_3-sensitive soybeans in an attempt to identify tolerant soybean cultivars; (2) quantification of the concentration of atmospheric O_3 and hydrogen peroxide (H_2O_2) present in observed atmospheric air pollution conditions in Raleigh, NC, USA; and (3) consideration of future environmental issues and agricultural research relating to the environment, particularly air pollution.

In the first month we were introduced to the location and organization of the research unit. There are two research centers: the first comprises a laboratory and greenhouses located on NCSU campus, and the second is a field laboratory located 5 miles from NCSU. The research unit has been conducting research on the effect of O_3 on *Arabidopsis sp.*, soybean, snap bean, and barley for several years, ranging from genetic, biochemical, and physiological characteristics to crop yield for crop improvement. I was taught several research techniques in this period, including a gas chromatography technique for ethylene measurement, intercellular infiltration for the histochemical detection of H_2O_2 and superoxide measurement, and enzyme extraction and analysis for peroxidase measurement. In addition, I was trained in the use of various pieces of

equipment, including the LI-6400 portable gas exchange system, spectrophotometer, and milling machine. I was lucky enough to share an office with Dr. Fitzgerald L. Booker and had the opportunity to discuss my research plan with him and other expert scientists. In addition, the tower for monitoring atmospheric O_3 and H_2O_2 was set up in the first week and continued to monitor for four days continuously every two weeks during my internship.

During the second month I worked on my own research, which focused on the effect of O_3 on biochemical responses of O_3-tolerant and O_3-sensitive soybeans. The soybean varieties were provided by Dr. Kent O. Berkey. They were grown in the free-O_3 greenhouse for 4 weeks and moved to the growth chambers, which had controlled environments allowing exposure to ambient O_3 (10 ppbv) and elevated O_3 (70 ppbv). The peroxidase, H_2O_2, superoxide, and ethylene concentration in the leaves and leaf injury were measured every 2 days after exposure. This experiment was conducted three times.

During the final month I continued to work on peroxidase measurement and was trained in data analysis using both Excel and SAS software. Most of the data were compiled and analyzed during this period. I also visited Raleigh History and Natural Science museums, the botanical gardens, a farmers market, church, natural parks, and lakes in North Carolina to learn about American culture, practice my English and gain other experiences. My extracurricular activities were made possible by the USDA officers and Thai students at NCSU.

2. Experience and achievements of the internship

This internship gave me the opportunity to share and exchange knowledge and ideas about environmental issues with international scientific experts. From these experiences and practices I learnt more about international perspectives and the wider research community. For example, the hot issues in this research unit are crop improvement for food security in the face of future environmental stress such as drought, cold and high temperatures, and air pollution, and research in these areas has been carried out for several years. This may indicate that environmental problems and food security are important issues, both now and in the future, and are closely related. As for the research community in this unit, the researchers and scientists generally co-operated and shared their ideas and knowledge, which made for a good atmosphere for doing research and conducting high-quality research. Moreover, I learnt that considering several points of views, literature reviews, and careful thought are important for conducting research.

In terms of my own project, there were some interesting findings. Our research team found that the sensitive soybean cultivar rapidly responded to elevated O_3. High O_3 concentration caused high peroxidase, H_2O_2, superoxide and leaf injury. It can be concluded that peroxidase plays an important role in regulating the H_2O_2 level and superoxide in plant cells. Increasing H_2O_2 concentration in the leaf caused cell wall loosening and leaf injury. The research results allowed for a greater understanding of the impact of O_3 on crop plants, which will help to identify O_3-tolerant plants for crop improvement. The O_3 and H_2O_2 measurements provided information on the phototoxic gaseous pollutants present in Raleigh during late summer. The work itself was interesting and provided me with the opportunity to learn several new techniques, which can be applied in environmental and agricultural science, both in future research and in academic classes. Working on a real topic and learning new techniques was an obstacle, but I learnt a great deal through hard work.

This project and internship would not have been possible without the support of my colleague, Mr. Prathomrak Na-ngern; my supervisor in Japan, Professor Masatoshi Aoki; my supervisor in NC, Dr.

Fitzgerald L. Booker, and Dr. Kent O. Berkey and all of their colleagues; Assistant Professor Sachi Ninomiya-Lim; and FOLENS staff. Finally, this internship allowed me to experience being both a leader and a follower, which are important qualities for a community- and field-oriented leader in the environmental sector.

The internship in the USA also had other, more personal, advantages. It allowed me to improve my English because I had the chance to communicate with native speakers and practice every day. I also participated in a different culture, including social habits, cuisine, and arts by traveling and spending time with American friends. Last, but not least, I met a number of fascinating people, both in the laboratory and outside, such as researchers and students in different fields of study − not only American people but also those from other ethnicities. For example, I had the chance to participate in some activities with the NCSU Thai student association, where I got to know some of the Thai students. They are nice, generous people, and they gave me a warm welcome. Fortunately, I became friends with some wonderful people and try to keep in touch with them. As a result, this internship was an invaluable experience that I will always remember fondly. Finally, I would like to thank everyone who supported me during this time.

3. Relationship of the internship experience to future career development as a field-oriented leader in the environmental sector

The experience I had during this internship was one of the most important and meaningful experiences in my life, and in my present position as a lecturer at Kasetsart University, Thailand. I gained several perspectives on the impact of air pollution and climate change on agriculture and natural resources, and on the international agricultural research community. I will be able to apply the knowledge and ideas from this internship to several academic classes, especially in a program of environmental and agricultural sciences such as plant response to environmental stress, plant climate, and research techniques.

This internship provided me with an excellent opportunity to work with outstanding scientists and allowed me to build relationships with them. After I graduate, I will continue to collaborate not only with the expert scientists I met in this internship, but also with professors, instructors, and students in the FOLENS program to conduct high-impact research with the aim of solving global environmental issues and enhancing food security as a field-oriented leader in the international community. This may help to support my dream of setting up an environmental and agricultural research center in Thailand. This would support local people and international researchers by providing information on environmental issues in local communities, as well persuading local people to become more concerned about environmental issues and food security.

Moreover, I will convey the invaluable experiences from this internship to my students, colleagues and others and encourage them to care about the environment and natural resources more than previously. I will try to lead the new generation to become environmentalists in the future. I will also make my knowledge available and give consultations to farmers and industries relating to suitable environmental management. Finally, I would like to set up a student environmental conservation club in the university to spread knowledge and environmental information to people to make them aware of and to care about the environment, based on my field work and studies.

Figure 1. Left to right: Dr. Fitzgerald L. Booker, me, Mr. Prathomrak Na-ngern, and Dr. Kent O. Berkey at the field laboratory

Figure 2. A greenhouse and an open-top chamber for studying the effect of O_3 on the biochemical responses of O_3-tolerant and O_3-sensitive soybeans

Figure 3. Researchers and graduate students in the research unit

Figure 5. Atmospheric O_3 measurement

Figure 4. Soybean leaf ascorbate peroxidase and DAF peroxidase enzyme assays and ethylene measurement using the GC system

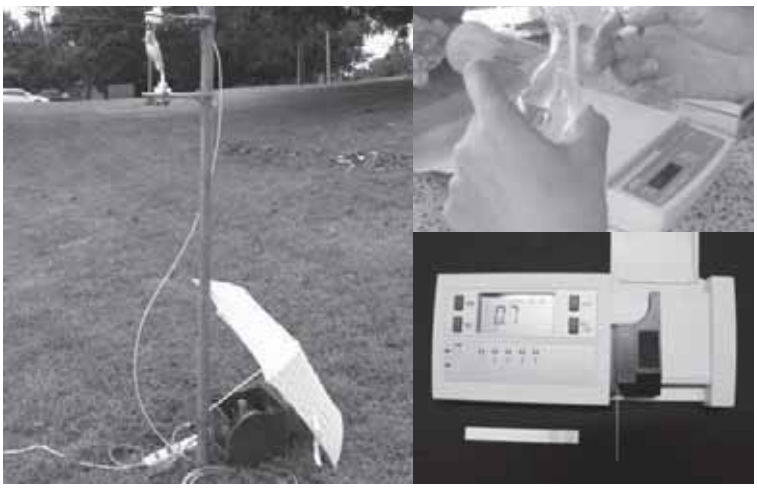

Figure 6. Atmospheric H_2O_2 measurement

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Report on an internship with IDEA Consultants, Inc.

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Key words: environmental consulting/assessment

(1) Activities during the internship

From October 11 through November 11, I completed an internship with IDEA Consultants, Inc. in Yokohama City, Kanagawa, as part of the FOLENS program. IDEA is an environmental consultancy firm with the objective of providing high-quality consulting services (for infrastructure development, environmental conservation projects, etc., as shown in Figures 1 and 2). Their services range from project planning, surveying, analyses, and assessment to project design, maintenance, and management. The department to which I was assigned during my internship plays a coordinating role, managing all the above processes. My main responsibility was to prepare some technical reports for an environmental impact assessment (EIA) for the expansion of Haneda Airport, on topics such as management systems for hazardous chemical substances used by the airlines and other businesses operating out of the airport and for water pollution from agricultural chemicals. These reports were submitted to clients such as government ministries (the Ministry of the Environment; Ministry of Land, Infrastructure, Transport and Tourism; Ministry of Agriculture, Forestry and Fisheries, etc.) and some private Japanese companies. Much of my experience during the internship involved organizing documents or data at the office. However, these reports were usually drawn up on the basis of actual field investigations, such as surveys of the aquatic, atmospheric, soil, and terrestrial environment or measurements of various chemical substances in environmental samples; these activities were conducted by other departments. I also attended a weekly staff meeting where each department reported their ongoing activities. In this way, I could know what kind of work the firm was doing—for example, reconstruction contracts and

Figure 1. Environmental impact assessment (EIA) for large-scale projects
Source: IDEA Consultants, Inc.
(http://ideacon.jp/en/contents/service/assessment.htm)

Figure 2. Survey to investigate the relationship between riverbank topography and aquatic biodiversity
Source: IDEA Consultants, Inc.
(http://ideacon.jp/en/contents/service/conservation.htm)

measurement of radioactivity in the Tohoku region after the Fukushima nuclear disaster, and surveys related to "Rio+20," which will be held in 2012—although I could not engage in all of these activities in practice. Moreover, people working in these departments sometimes kindly agreed to be interviewed and share their stories about their work, tips about their area of expertise, and attitudes toward environmental issues. These were all invaluable experiences for me.

(2) Experiences and achievements during the internship

The purpose of my internship was to learn what environmental consulting firms such as IDEA actually do and how these companies work as businesses that tackle environmental issues. To get an answer to this question, I decided to take an internship with IDEA; I felt that the experience would be a chance to get a clear picture of how to develop a future career in the environmental sector. Through my internship, I got an in-depth understanding of what kind of work the firm does by helping with a part of it. Environmental consultancy firms such as IDEA participate in the policymaking process by providing advice and recommendations based on their research findings. With the aid of such firms, the Japanese government and private companies can promote infrastructure development with a minimum impact on the environment. IDEA's research also contributes greatly to the establishment of conservation law. I also learned that IDEA makes positive efforts to contribute to international cooperation by supporting partnership projects with other countries, especially developing countries, by extending their services in infrastructure development or environmental conservation, as seen in Figure 3.

From my work with IDEA, I have learned that Japan is a leader in the development of pollution-control technology and has the world's strictest environmental quality standards; however, at the same time, Japan is one of the world's major polluters. Thus, the Japanese people are collectively responsible for widespread destruction of the environment and should therefore become leaders in solving global environmental problems, as is widely advocated. At present, Asian and African countries are experiencing escalating demand for natural resources, food, and water, on top of soaring pollution and health problems, as well as increasing greenhouse gas emissions due to rapid economic expansion and population growth. There is an urgent need in these countries to develop sufficient knowledge and mastery of conservation techniques to ensure sustainable development. However, during the internship I also found that almost all of the international support to these countries is implemented in the form of official development assistance (ODA) projects. In recent years, private companies have come to play an increasing role in international cooperation, as evinced by the rise of public–private partnerships (PPPs) and the emergence of base-of-pyramid (BOP) business and of socially responsible business. However, financial contributions by private foundations or NGOs, even in activities funded by ODA, are still necessary at present. In other words, at least in Japan, businesses that provide environmental technology or knowledge to developing countries without depending on ODA are rare.

Figure 3. Laos—Technical cooperation on riverbank protection works
Source; IDEA Consultants, Inc. (http://ideacon.jp/en/contents/service/overseas.htm)

ODA is of course very important for developing countries. However, environmental technology transfer has its limitations if it is done only on the basis of ODA. I feel that private companies ought to

provide technology or knowledge directly to developing countries under a business model, and also that by creating growth and employment, these business activities will be indispensable for the sustainable development of these countries. On the other hand, it is difficult for private Japanese companies to enter on their own into international cooperation activities, because these businesses are not economically sustainable for them. As a result, despite Japan's has environmentally advanced technology and knowledge, we cannot say that the nation succeeds in providing sufficient assistance to developing countries. It is crucial for Japan to maximize the transfer of technology and knowledge to developing countries, but much of this knowledge is possessed not by government but by private companies. In my opinion, it is necessary in international cooperation and development to fundamentally review the existing division of responsibilities between the public and private sectors. The most important problem to address is how to create a "win–win" situation for both Japan and aid-recipient countries.

These points and questions are what I obtained from my internship at IDEA.

(3) Relationship of the internship experience to future career development as a field-oriented leader in the environmental sector

Through my internship experience, I found that working at an environmental consultancy firm such as IDEA Consultants, Inc. is an ideal model for my future career as a field-oriented leader in the environmental sector. I wish to work in this area in order to help identify the undesirable effects on the environment that might arise from human actions and devise measures to mitigate them on the basis of field data from environmental impact assessments. In other words, I believe that this work will lead us to an environmentally friendly society. However, as I mentioned in section 2, from a global perspective, Japan requires people to work in this sector who can transmit our environmental technology and knowledge to other countries, especially developing countries that face serious environmental problems or will face them in the near future. This can be done in diverse ways, such as through private Japanese companies and institutions, including environmental consultancy firms, universities, and NGOs.

Meanwhile, thinking about leadership in the environmental sector from a slightly different point of view, I also feel the need of generating value by actively solving environmental problems. I mentioned in section 2 that it is important to create a "win–win" situation for Japan and aid-recipient countries so as to promote the sustainable development of these countries. To accomplish this challenge, I believe we need to turn the solving of environmental problems into a business. For example, at present, a number of environmental NGOs are experiencing funding difficulties, although their activities are at the very heart of progress on environmental problems. In other words, their activities often tend to be viewed as volunteer work, not business. It will be difficult to fully resolve all the environmental issues we face unless we change this view. This means that cutting-edge research in this area, which is mainly conducted by NGOs and universities, needs to be made sustainable as a business. To do this, our fundamental way of viewing the environment needs to be changed. Furthermore, to create a new framework for the environment in which economic value is generated by solving environmental problems is indispensable at not only the national but also the international level. Through my internship experience, I came to feel strongly that that the development of a favorable environment for addressing environmental issues is one important role of a leader in the environmental sector.

Acknowledgements

I would like to thank IDEA Consultants, Inc. for accepting me as an intern. Additionally I must extend my thanks to Dr. Takada (professor, FOLENS program leader), Dr. Ninomiya-Lim (assistant professor, FOLENS coordinator), and all FOLENS faculty for supporting my internship.

Report of Internship Training
FOLENS Program
Tokyo University of Agriculture and Technology

Internship in the Ecosystems Research Division, Environmental Protection Agency (EPA), including the AGU fall meeting

Sooyoun Nam
International Environmental and Agricultural Science (IEAS)

Key words: field-oriented, environment, Asia, Africa, suspended sediment (SS), SWAT modeling

1. Activities during the internship

During my internship program from November 7 to December 10 in the Ecosystem Research Division (ERD) of the United States Environmental Protection Agency (EPA), I had the opportunity to be a member of ERD working on contaminants, nutrients, and biota in environmental systems, and the development of mathematical models to assess the response of aquatic systems, watersheds and landscapes to stresses from natural and anthropogenic sources. My visit lasted for four weeks.

Here is a week-by-week summary of my activities. In the first week, I attended two types of orientation: security and CTS computer support. In addition, I attended a small meeting on statistics with the title of 'Profiting from prior information in Bayesian analyses of ecological data', introduced by Dr. Katie Price, who is a post-doctoral geographer in ERD of EPA. I was sincerely thrilled to attend and expectant because of the chance to hear what they had to say and to improve my own knowledge. In the second and third weeks I observed sample collection at the study site with Dr. Roger A. Burke, who is a researcher in biological chemistry in the ERD of EPA. I learned the ICS-2000 method of analysis, for analyzing chloride (Cl) and nitrate-nitrogen (NO_3-N) from Dr. Burke. Dr. Price taught me about the process of SWAT (Soil and Water Assessment Tool) modeling, and I attended a seminar, called 'Field-scale fate and transport infiltration'. I had never studied SWAT modeling previously, so it was very difficult to understand, although it was useful studying the many scientific aspects of the tool.

In the fourth week, I learned parameter calibration and upscaling related to modeling, and I tested for N-NO_3 and P-PO_4 using a spectrophotometer. Before I began, a lab technician taught me how to perform the analysis and the uses of the machine. We made reagents for doing a calibration test for N-NO_3 and P-PO_4 and prepared to collect samples at the Whitehall Forest and Jefferson Culvert (Figure 1a). I was interested to learn the different methods of chemical analysis using the different equipment. Although this experiment was very sensitive and complex, it was a valuable experience.

Towards the end of my internship with the EPA, I attended the American Geophysical Union (AGU) fall meeting in San Francisco from 3 to 9 December. There I learned about the various issues relating to environmental problems from the oral and poster presentations, and I had a chance to receive comments on

my own presentation and to have a discussion with researchers (Figure 1b).

Figure 1. My internships activities: (a) the Ecosystem Research Division; (b) a seminar organized by the division; (c) the street outside the AGU fall meeting in San Francisco; (d) a presentation at the AGU meeting

2. Experience and achievements resulting from the internship

I learned about taking an interdisciplinary approach through a variety of experiences, including attending a small meeting, attending a seminar, and participating in experiments at the ERD for four weeks. In other words, this research allowed me to freely communicate with many researchers on interdisciplinary projects, which led me to see the broader aspects and different viewpoints related to recent studies. In addition, I was interested to see how they approached one theme with different ideas and various researchers, even if they were not directly related to this theme.

In the ERD, I was a member of the bio-ecosystem team looking at the behavior of contaminants, nutrients, and biota in environmental systems, and modeling these to assess the response of watersheds and landscapes. Thus, I was able to learn analytical methods for assessing $N\text{-}NO_3$ and $P\text{-}PO_4$. $P\text{-}PO_4$ requires preparing reagents for the samples. After this, I checked the calibrations of $N\text{-}NO_3$ and $P\text{-}PO_4$ (R^2 = 0.9998-0.9999), and then analyzed the samples using the spectrophotometer. The greatest advantage of the spectrophotometer is that it is convenient to use and saves time on the analysis.

The results are presented in Figure 2a. I was able to participate only in pre-testing for monitoring due to the dry season. In addition, I participated in an experiment measuring water flow (velocity) and pH in a stream located near to several livestock farms. The reason for sampling at this location was that livestock farms can accelerate the increase of suspended sediment. According to several research papers, high concentrations of suspended sediment (SS) can have an impact on fish and aquatic ecosystems (Newcombe and MacDonald, 1991). These broader concerns have prompted studies of the impacts of land use on suspended sediment concentrations (SSC) in streams. I also tested the pH in the stream (Figure 2b). Although no significant pH and temperature increases were observed, point 5 was a little higher than the others because of its location near a reservoir.

I learned about SWAT modeling, which is based on hydrological moldering in the watershed. Dr. Price explained the process of SWAT modeling. She said it involves simulating stream flow with a SWAT watershed model, and then calibrating each data type for each watershed and simulated stream flow and comparing these with the United States Geological Survey (USGS) observed stream flow (Figure 2c).

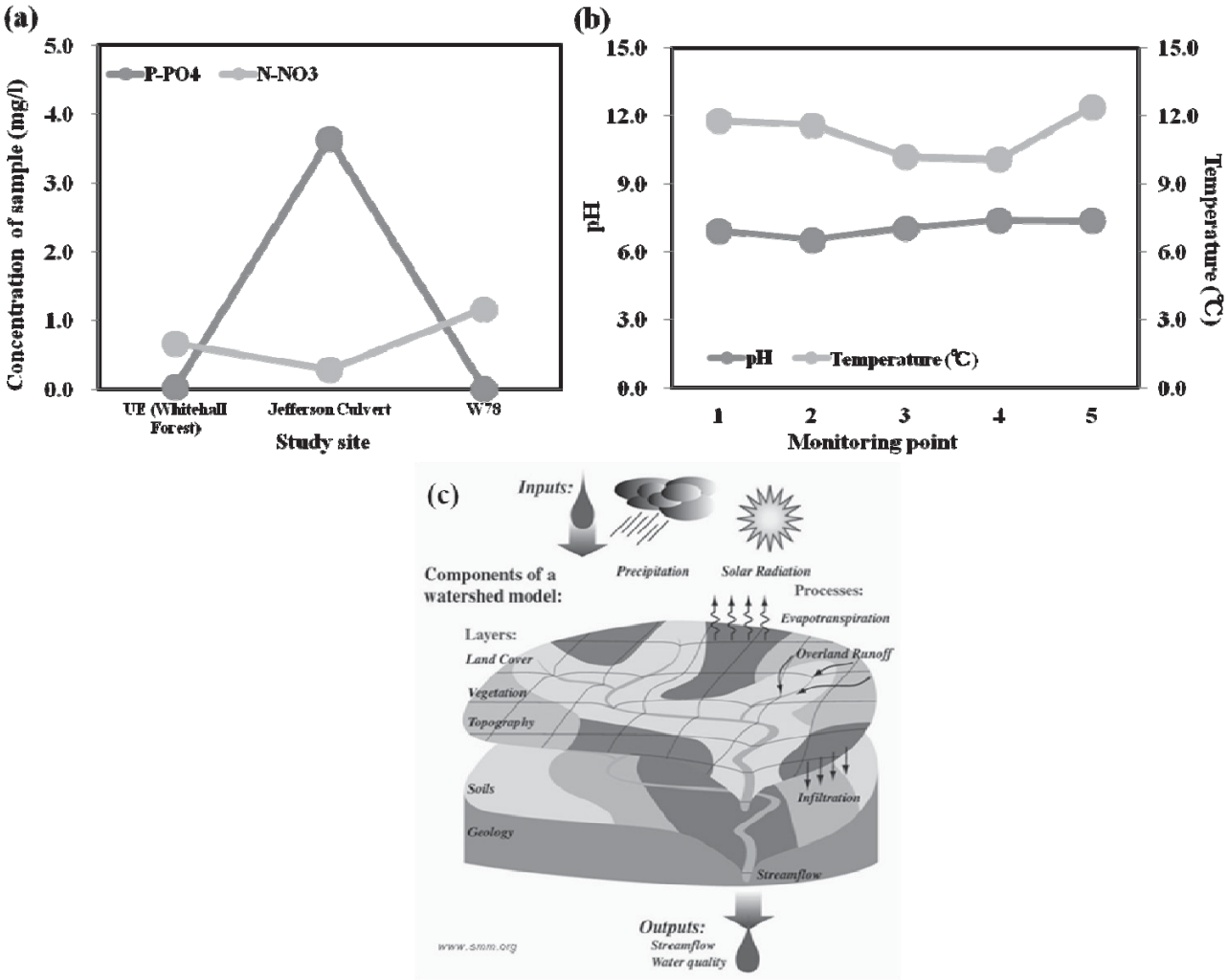

Figure 2. (a) $N\text{-}NO_3$ and $P\text{-}PO_4$ levels from samples at the study sites; (b) pH and temperature at the monitoring points; (c) SWAT modeling (source: K. Price et al., 2011)

At the AGU fall meeting I gave a poster presentation with the title 'Radionuclide deposition and fine

sediment transport in a forested watershed, central Japan, on December 8, 2011'. At this conference, I had the opportunity to see updated information from projects conducted by EPA scientists (not only from my host group but from across the USA). I also introduced my project at the Tokyo University of Agriculture and Technology (TUAT) on developing an international network for tackling and sharing information on environmental and agricultural problems, through a poster presentation. I participated in an evaluation of my poster presentation by a judge. At that time, I received questions and comments that will enable me to clarify what I will reinforce and revise in the interpretation of the results of my studies, and I discussed the topic with many students and researchers.

Figure 3. Poster presentation and exhibition at the AGU fall meeting
(Source of photos: http://sites.agu.org/fallmeeting/)

3. Relationship between the internship experience and future career development as a field-oriented leader in Asia and Africa

As a result of this internship experience I expanded my scientific and practical knowledge, and heard different views on approaching and developing watershed systems, including mitigation of environmental disasters such as flooding and water pollution. In particular, I learned a great deal about water pollution from participating in an experiment involving chemical analysis and a field survey, and about watershed systems from the SWAT modeling. I also gained valuable knowledge, skills and experience that will help me to become a leader in the environmental sector.

I realized that the same environmental problems will be occurring under similar environmental and socioeconomic conditions when we compare the geomorphology and geography across Asia and Africa. As a result, these experiences, including learning about interdisciplinary project teams, will be strongly connected to my future career in tackling environmental concerns, including aspects of forest management and sediment dynamics in South Korea, as well as in the general Asian and African regions.

When I return to South Korea after studying in Japan, I will be able to make use of the various methods relating to environmental problems that I learned through this internship experience, and will be

able to approach anyone in Asia or Africa to inform them of the importance of forest management for preventing global environmental problems. Lastly, I would like to thank my hosts, Dr. Sidle, Dr. Price, and Dr. Burke, for all their kind help while I was at the ERD. I would also like to thank FOLENS and Professor Takashi Gomi for enabling me to participate in this internship, which was a very valuable experience for me.

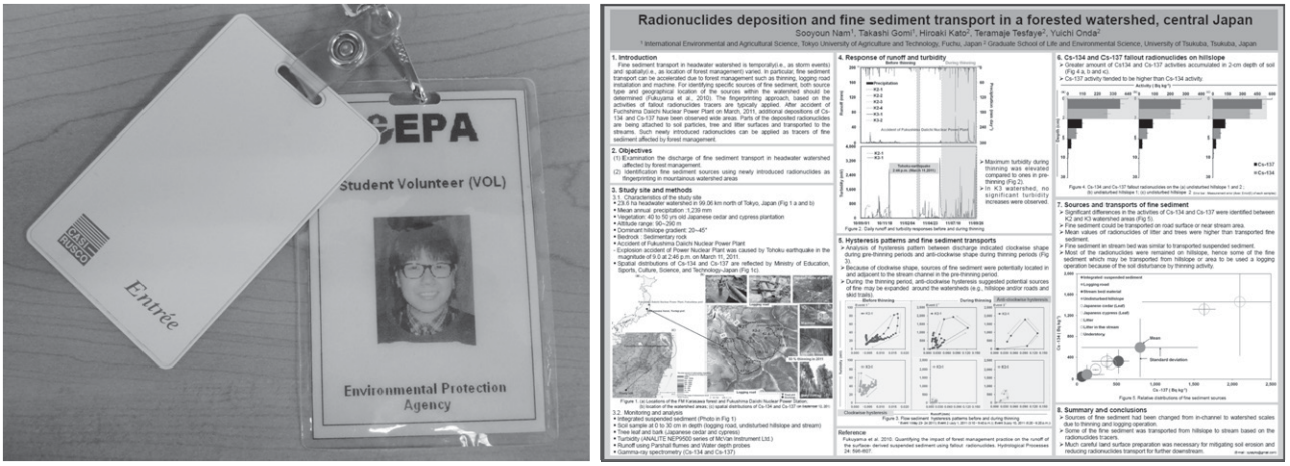

Figure 4. My name tag and poster presentation

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Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Mangrove forestation in the Philippines

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Tokyo University of Agriculture and Technology

Key words: Forest, forestry, eco-tour, mangrove, Philippines

1. Activities during the internship

IKAW-AKO, which means “You and I” in Tagalog, has been conducting many projects in the Philippines to restore shorelines that have been damaged due to logging for firewood, and to foster friendship between the Japanese and Filipino peoples. Activities during the internship mainly consisted of mangrove forestation, daily monitoring, and organizing study tours.

1. Mangrove forestation

During the internship we conducted mangrove forestation about three times a week, cooperating with the local elementary school, high school, and sometimes guests such as Japanese visitors. To carry out mangrove forestation it is necessary to make all the arrangements first, such as preparing the seedlings, deciding where to plant and who to plant with, then writing letters to city officials to get authorization, and finally borrowing a bus to transport the large number of forestation participants. These operations all became part of my work as a trainee. As part of the forestation, we gave short lectures to the participating students about how to protect the shoreline by planting mangrove.

Figure 1: Mangrove forestation with the Bongol elementary school

Figure 2: Mangrove forestation at Barangay Bocana, Ilog

2. Daily monitoring

To foster mangrove trees, daily cleaning up and monitoring are necessary, besides planting new seedlings. Because planted trees can be easily attached oysters and garbage mainly came from upper side of river and sometimes resulted in bright. To avert these problems, IKAW-AKO has organized people to maintain each of the planting sites. These people periodically go to the mangrove site to clean up garbage and nurture the seedlings. IKAW-AKO also often travels to each planting site to check the status of the trees and seedlings. If daily monitoring is done well, mangrove survival rate can be up to 90%.

Figure 3: A well-maintained mangrove site at Barangay Bocana, Ilog

Figure 4: A bridge used for monitoring and eco-tours in the Mangrove forest in Balaring

3. Study tour

IKAW-AKO organizes many study tours (which means the participants study during their tour), and there were two big tours during my internship period. One was the 66th IKAW-AKO study tour. This is an annual tour organized by IKAW-AKO, and this time it was held from February 16 to 23, 2012. The other one was the Chikyu-no-Arukikata international volunteer tour, which is run by Chikyu-no-Arukikata and assisted by IKAW-AKO. This was held from February 28 to March 2, 2012. The aim of these tours is to plant mangrove and foster relationships between the Japanese and Filipino peoples. We made all the arrangements, such as preparing the seedlings, cleaning the planting site, and developing the cultural interaction program.

Figure 5: Cultural interaction during the 66th IKAW-AKO study tour

2. Experience and achievements

Mangrove forestation

Through mangrove forestation I realized the importance of cooperating with local people. If mangrove planting is only done by outsiders, such as Japanese visitors, the local people will not understand why the mangrove is there, and they might log it after the trees become mature. Through cooperating with the local people, we can share the idea that mangrove protects their lives.

I also learnt how to develop local organizations and their importance, because if there is a local organization, the project can be ongoing and activities can be maintained even if there is no voluntary funding from outside sources. IKAW-AKO has organized six local organizations in the province of Negros Occidental. We taught them how to grow seedlings, and developed guidelines for periodically cleaning up the sites. Most of these organizations are currently dependent on IKAW-AKO for funds, but one of the local organizations has made a bridge inside Mangrove forests, which is used for sightseeing. Now, many tourists come to the mangrove forest, and the locals can earn money from the entrance fee or sales from seafood restaurants. They can then utilize this money for cleaning up or planting mangrove. This is a truly sustainable way of funding the work.

Monitoring

As mentioned earlier, there is a lot of garbage at the planting site and this sometimes contributes to mangrove early mortality. To solve this problem, IKAW-AKO takes measures that interaction between shoreline residence and mountain side residence; such as mutual visit or planting plant at each side with other side residence, because most of the garbage comes from the upper side through river. It was a good

experience for me, because I had no idea, before I came to the Philippines, about how to handle watershed management.

Eco-tour

By making arrangements to prepare for the tours, I was able to experience many facets of non-government organization (NGO) daily work, such as writing letters to city officials, preparing rewards, or even writing reports for the authorities. Through this work I came to realize that IKAW-AKO activities have been assisted by many people.

As a field-oriented leader

This internship was my first opportunity to stay so long in one region, and I was gradually able to learn what the local people think, want, and need. The people who live in Negros Occidental used to have very harsh lives due to the crushing sugar market price, and so they feel very apprehensive about becoming poor again. We understood this, and we stressed that mangrove nurtures various sea creature and creates sustainable food resources whenever it is planted. That is why, I think, they cooperated with us. Besides the local people, the city officials really helped us by authorizing us to use public land for planting mangroves, and also let us use many city facilities free of charge. This help resulted from the long-term relationship and shared ideas between IKAW-AKO and the city government.

I now realize that being a field-oriented leader means understanding what the local people think and want, developing a good relationship with them, cooperating with them, setting goals with them, and then achieving these goals.

3. Relationship to future career development as a field-oriented leader in the environmental sector

During this internship I noticed that many environmental resources have been damaged, such as the devastated mangrove forest. This has not yet reached a dangerous level, but it might do so in the future. I hope to engage in restoring natural resources such as forest as my lifetime work.

In the course of this work I would like to visit field sites many times, both to see what is going on and to maintain a good relationship with the local people. I will not operate only in one region, but would rather spread my activities to adjacent districts, cities, and organizations. This is because, in terms of environmental issues, problems cannot be solved in one region. I hope I am able to engage in such work.

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

The Strategy of Saving Farming Resources in Rice Cultivation in Small-scale (Central Vietnam) and Large-scale field (Mekong Delta).

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International Environmental Agricultural Science
Graduate School of Agriculture
Bach Ma National Park and Hue University of Agriculture and Forestry
Location: Bach Ma National Park
Duration: From 14 February to 13 May 2012

Key words: Farming Resources, SRI (System of Rice Intensification),

1. Targeted/related environmental issues and their background

The targeted environmental issue in this internship was the “excess inputs to paddy field” such as sown rice seeds, applied chemical fertilizer, sprayed pesticide and herbicide etc. It causes lots of environmental issues. For instance, the excess application of nitrogen fertilizer causes the generation of methane, which is one of green house gases, while highly drained pesticide to canal and river threaten lives of insects.

Since the introduction of “Green Revolution”, the rice cultivation with a combination of high inputs and the use of a hybrid variety has been expanded to all over the Vietnam. It has been strongly pushed by the government forward international competition in rice production and offered higher rice production to the famers. On the other hand, the use of chemicals for paddy field has drastically increased, which is currently a serious issue to be immediately solved. In fact, the issue occurs because the famers have less knowledge about the use of chemicals. In addition, the government paid less attention to its influence on the environment. In order to reduce the inputs to the proper amount, the local government and agricultural association have tried to instruct the farmers.

Fig. 1 The location of targeted area in this internship (A: Bach Ma national park, Hue University of Agriculture and Forestry, B: Can Tho University)

Because the solution of the issue is closely related with raising farmers’ living standard as well as the establishment of sustainable rice farming in

Vietnam, I was interested in this topic.

2. Objective

The objective of this internship is to find out the principle for expanding and maintaining sustainable rice farming in Vietnam.
In addition, I aimed to study the importance as an environmental leader in my future.

2. Activity in Central Vietnam

Target area: Khe Su Hamlet, Thua Thien Hue Province, Central Vietnam
Introduction: In this area, the excess use of chemicals in rice faming has been serious issue according to the basic investigation of JICA glass root project of TUAT (Tokyo University of Agriculture and Technology). Some of the residents have suffered health damage from spraying chemicals. On the other hand, the famers in Khe Su have made their living with plantation of acacia. But, they have cut the trees not only in their garden but also in the national park where cutting tree is prohibited. In order to solve these two issues, TUAT have transferred the technique of organic farming to the farmers. Because it has been focused on just the vegetable production, I have tried to transfer the technique of organic paddy rice cultivation, which is called O-SRI (Organic- System of Rice Intensification).
Method: Trial of O-SRI in the farmers' paddy field with them
Period: From 14 February to 13 May
Result: We compared O-SRI and the conventional cultivation in the famers' paddy field in term of their yield and impacts for famers' economy.

In the end of Dec., the rice was sown and transplanted and the rice was harvested in the middle of May. As the result of the experiment, SRI (2.1t/ha, with the planting density 20x20cm) was lower than the conventional cultivation (3.2t/ha, with the seed volume 180kg/ha) in yield. On the other hand, as the positive effect of O-SRI, it was successful to cut the chemical inputs (costs) off. The total cost of O-SRI and conventional cultivation were 5 USD/ha and 367USD/ha respectively. The rice yield is the largest motivation for the farmers in Khe Su to try such high-labor cultivation.
Discussion: The reason of low yield in SRI paddy field was the small number of panicles (flowers) per a unit. According to the information of the rice variety used in this trial, "Kang Dan", it was indicated that its character caused such small panicle number. The variety fits with the conventional cultivation (direct sowing), which doesn't require high panicle in a plant. Generally SRI theory shows that the sparse transplanting brings drastic growth of panicles (20-30 panicles/ plant) to rise rice paddy yield. In addition, transplanting rice plants is the moderate way for wide spacing like 25x25 or 30x30cm because it's difficult with direct sowing for the farmers who don't have any tools and machines. However, we could not find such amazing plants in our trial. Because of the reason, the variety is considered as the cause not to provide high yield under SRI (transplanting) in Khe Su Hamlet.

Because Khe Su hamlet is located far away from the center of Hue city, the variety that the farmers can parches is quite limited. That's just "Khang Dan" and another low-quality variety in the local market near-by their residence. To seek sustainable agriculture under the limited situation, "Khang Dan" should be used in my opinion. Therefore, in the next SRI trial in Khe Su, we need to focus on "how to rise the number of panicles per a unit" with using "Khang Dan".

Fig. 2 Transplanting with the farmers in SRI paddy field, Khe Su, Bach Ma national park

3. Activity in Mekong Delta

Target area: Hau Giang Province, Southern Vietnam
Introduction: The targeted area is located in Mekong Delta, which is the largest rice production area to supply 50% of rice production in Vietnam. After the expansion of "Green Revolution", the excess use of chemicals to paddy field was a serious issue also in this area. To solve it, the local government proclaimed an agricultural campaign, "3 Reduction 3 Increase". "3 Reduction" means chemical fertilizer, pesticide and seeds volume, while "3 Increase" indicates the increases of the quality of rice, rice production and farmer's income. For instance, drum seeders was introduced toward reducing the input of seeds and the farmers were instructed not to use pesticide in early growth stage of rice. As the result, this campaign succeeded in reducing the inputs to paddy field and contributed the development of rice farming in Mekong Delta.
Objective: Collect the actual impacts of "3reductions 3 increases"
Methods: Interview for a farmer
Result: I visited a close farmer's house and interviewed him about "3 Reductions and 3 Increases". Though he took so long time to understand and try it, he recognized its positive effects; reduced the seed volume from 200-300kg/ha to 100-150kg/ha, less amount of chemical fertilizer and 2-3 times less than before pesticide. I could understand the effects of the campaign not only from the documentation published by local administration but also the voice of a farmer.
Contribution for Central Vietnam: I brought a drum seeder and a leaf color plate, which have been used for the campaign in Southern Vietnam. In order to share the information of the leading case for reducing the inputs to paddy field, I took these tools for the professor who is a cooperative researcher of the SRI trial in Khe Su. He promised me to expand the useful and effective technology to Central Vietnam.

Fig. 3 Interview the famers in Mekong Delta (Mr. Trung, An, Sau and me from left side).

4. Forward action for sustainability

In this internship, I studied that "profits" is the largest incentive to make farmers aim for the environmentally –friendly rice cultivation system. In Mekong Delta, because the famers recognize that the inputs (seeds, chemical fertilizer and pesticide) can be reduced by following "3 Reduction 3 Increase", they have kept going on that technique. On the other hand, in Central Vietnam, because SRI has not been successful yet to provide the higher benefit to the farmers because of lower yield, just a little farmer have tried to do it. These farmers are so serious to maintain their current income, so they give the higher priority their income (=money) rather than sustainable farming. I think it's difficult to change such their mind. If I was a farmer, I would be so serious as well. In addition, I have understood that it takes a long term to transfer a new technique to farmers because of the same reason. Mr. Sau who I interviewed in Hau Giang province has followed "3 reductions 3 decreases" since 2005, while the program was officially lunched in 2003. He told that he had hesitated to try it at the beginning of that program, but he tried it and got its benefits after he heard good rumor about it from his neighbors. It indicates the importance for making a model field or garden that shows the successful case of new technology and motivate farmers to try it.

Thus, in order to succeed in expanding SRI in Central Vietnam, we need to show the farmers its benefits in the model field. The 2nd SRI trail is currently going on in Khe Su. I keep these lessons in mind and wish to work for it.

Through this internship, I learned that the base of seeking sustainable agriculture is the establishment of human relationship. To be friendly with farmers, so long time is required. In my first visit in Khe Su Hamlet, the farmers answered my interview with their faces a little nervous. The more I have visited their house, however, the friendlier we became. The farmers eventually switched to spontaneously talk about the issues that they were facing on and their idea on their farming. Thus, because I was successful in extracting their honest voice, I could work with them toward sustainable rice farming. I am currently friendly with Mr. Sau, a farmer in Hau Gaing Province. When I was an undergraduate student, I have visited his house and talked many times as well.

In the future, what is the importance for a environmental leader is not to hope the result for a short period and to make the efforts for the good relationship with the people who will be related with me.

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Internship with Bridge Asia Japan in Maungdaw area and Study the rice farming system and its related environmental problems in Kanyutkwin, Myanmar

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United Graduate School of Agriculture
Host Organization: Bridge Asia Japan (BAJ)
Location: Maungdaw, Rakhine State, Myanmar
Duration: 14 May – 10 July, 2012

Key words: Non government organization, Community development, Environment

1. Activities during the internship

From 14th May to 9th June, 2012, I joined the Bridge Asia Japan (BAJ) as an intern under the Education Program for Field Oriented Leaders in Environmental Sectors (FOLENS), TUAT. BAJ is one of the non-governmental organizations (NGO) which provides assistance for people facing difficulties such as poverty and discrimination in Myanmar. The goal of BAJ is to think and act together with the communities in need in order to build bridges of mutual understanding and trust, and to aid these communities in becoming self-sufficient. To fulfill this goal, BAJ is working in Maungdaw area with local and international staff members. The activities are repairing vehicles and machines used by U.N. organizations and international/local NGOs and constructing basic infrastructures to promote the reintegration of returnees. We also hold technical training courses in repair and maintenance of machines and vehicles for local youths to facilitate their income generation. For this purpose, BAJ composed of five sub-teams such as office, workshop, community social development, income generation and account team.

After my arrival at BAJ, I was assigned as Acting Community Development Program Coordinator for the community development program. During my internship, there were three trainings, one advanced motorbike repairing training course in the head office of Maungdaw, five basic sewing trainings in villages and one life saving training in Maungdaw. My responsibilities were to take charge of these trainings to be efficient and effective for local people during the training periods and to assess the impact of the present and previous training courses for community development.

I attended every Monday meeting with all staff members of BAJ. On that day, team leaders and sub-leaders have to present the schedule for the present week. Program Manager finalized and gave instruction and suggestion for each team. On all other office days, we made meeting with team leaders to discuss about

the daily schedule. In the second week, on Monday, I gave one presentation to all BAJ members about the "FOLENS program", "my research" and "save our environment".

When I arrived there, advanced motorbike repairing training was already started. I frequently visited around there to get good relationship with local young people. Under the community development program of BAJ, I gave one lecture to them about my experience and 10 basis points for how to save our environment in terms of clean water, electricity, reducing plastic usage, growing trees and saving energy to save our world. With a program manager and other staff members, we often went to the construction sites and checked the conditions about the labors, raw materials, suppliers and other things.

On Friday, 8th June, 2012, there was a sudden change of the condition of Maungdaw area. The very cruel events painted an ugly picture in Maungdaw area by shedding of innocent people's blood. 1,000 Bengali-Muslims in the border town of Maungdaw started a severe riot on that day at about 2:00 pm in the afternoon after their Friday midday prayers killing at least four Burmese Buddhists and injured many more. In that time, we heard that the crisis between two groups of people expanded throughout the Rakhine State.

Because of this alert condition, BAJ arranged to send all local staff members (Maungdaw region) to their house safely. Only five people including Program Manager (PM) and me stayed overnight in the BAJ compound to protect the office.

The next day, 9th June, we closed the BAJ and moved to the UNHCR compound, an evacuated area for all NGOs members. On 10th June, we moved to Buthitaung by NGOs cars accompanied by two escort cars. At Buthitaung port, NGOs speed boats were waiting to leave for Sittwe and we arrived there at 4:00 pm. On 11th June, we went to the airport to leave for Yangon and waited the flight until next morning. On 12th June, 2012, we arrived at Yangon safely with other NGO members. There we could visibly escape from danger. We made brief explanation with BAJ head office staff members in Yangon.

From 14th June to 8th July 2012, I was in the Kanyutkwin area, Bago division, to set up field experiment in paddy rice fields. The objective of this study was to assess the greenhouse gas emission from farmer rice field. I also planted shade trees along the road sides and some teak trees in the farmer farm with local people.

Meeting with local people for construction of local community center in village site

Giving speech in the opening ceremony of basic sewing training in village site

Lifesaving training site giving instruction by facilitator

Practicing and repairing the motorbike engine during training

Bengali Muslims setting fire local people's houses in Maungdaw area

2. Experience and achievements

The purpose of my internship was to study the NGOs activities, local community and their environment. To fulfill this purpose, I joined Bridge Asia Japan (BAJ) carrying out developmental assistance activities together with people and communities in Maungdaw area, Northern Rakhine State.

Every Monday, they had meeting with all the staff members and announced their weekly plan. There were discussions and suggestions by different team members of BAJ to smooth their activities. What I got from that weekly meeting was to understand that planning, good preparation and sharing data information are very important to progress the activities. Before starting daily works, they had team leaders meeting for daily plan. In that meeting, program manager requested to give comments and suggestions from different teams and set decision for daily activities. What I understand is taking the vision from bottom and set the decision plan by the top and working together with different teams are very important points for an NGO to finish successfully all their activities. On Monday meeting, I gave one presentation to all BAJ staff members about my research and 10 points to save our environment. I noticed the people's interest about environment and discussed some points related to their daily life. And I also gave one lecture to young local people about my experience and environment which is very interactive and I received a lot of questions from them concerning with waste management and clean water, and also international experience.

BAJ is working over there with three main goals. The first one is providing opportunities for acquiring

vocational skills and capacity building. By utilizing appropriate and traditional technologies that exist in local communities while introducing new skills, BAJ provides opportunities for acquiring vocational skills and capacity building to such vulnerable individuals as returnees, young adults deprived from educational opportunities and women with limited employment opportunities. For this purpose, BAJ provided a lot of trainings in BAJ compound and also in the village sites. As an acting community development program coordinator, I discussed with the facilitators to improve the training activities and suggested to use interactive systems, visual media such as activity related videos and to focus on good and weak points of the training participants. I also learned a lot of things from these trainings such as how to plan and manage the training, selection criteria of the participants (eg. age and education level depend on type of training, their attitude and willingness to the training), public interests to the training and how to motivate young people (eg. incentives and self esteem by training) to become actively participate in the training.

The second goal is assistance in income generation. I had good experience about income generation that not only providing the training such as basic and advanced sewing training, they also gathered young women who already finished the sewing training and generated their income by providing necessary things in the BAJ workshop. They received clothes order from other NGOs for income generation of young women.

The third goal is development of basic infrastructures for community vitalization. What I learned from this section was how to get smooth communication and discussion with local people, project planning and supply chain for the raw materials and labor management in constructing the community center.

Unfortunately, I didn't finish my internship period because of the Bingali-Muslim Crisis in Maungdaw and other areas, spreading around the Rakhine State. I had experienced how to reach the evacuated area with NGOs members and the way to come back to Yangon from Maungdaw area. During moving to the evacuated area, I recognized the role of leadership and the ability of the leader to make timely decisions for safety the staff members of BAJ to send back to their home and to reach saved area.

In Kanyutkwin, Pago Division, I conducted the experiment by the help of local farmers to assess how much rice fields in this area produce greenhouse gas for global warming. In this area, I joined with local people to grow shaded trees along the road side and also in the farmer farm.

To conclude, I can state that my internship at the BAJ was a rewarding experience and provided me with some new perspectives that I did not come across during my studies back at the college.

3. Relationship to the future career development as a field-oriented leader in environmental sectors

Internship experience will have a positive impact on my future career development. Through internship, I gained a lot of experience about NGO activities and local community. It was very exciting that NGOs were working not for their profit but only for local community development. Most of the NGOs in that area worked for community development especially on basic infrastructure such as bridges, schools, roads and local community centers. Some NGOs worked to enhance local people's income generation by vocational training. But I found that NGOs in these areas are working only for local people, not directly addressing environmental issues. As a future field oriented leader in an environmental sector, I would like to fulfill this gap to integrate community development and also an environmental sector. For this purpose, I shared and exchanged the knowledge about how to save our environment with NGO members and local young people. The environmental aspects should also be the priority focus in community development. I believe that in the near future after graduation, I can participate with local people for community development intern of social, economic and also environmental sectors by working with humanitarian organizations. In order to be a field

oriented leader, I have to learn to enhance my knowledge and skills related with environment and also communication under FOLENS program. Lastly, I would like to thank Mr. Tsuji Fukio and all BAJ staff members, for their kind help during my stay there as an internship participant. I would also like to thank all FOLENS members for enabling /allowing me to participate in this internship, where I got a lot of valuable experience for my life.

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Marine debris and conservation: Raising awareness and education in urban and rural communities in Queensland, Australia

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Graduate School of Agriculture
Host Organization: Tangaroa Blue
Location: Port Douglas, Queensland, Australia
Duration: 3 weeks

Key words: Marine Debris, Marine Conservation, Environment Awareness and Education

Background of Organization

Tangaroa Blue is a non-profit organization founded by Heidi and Richard Taylor in Western Australia. It started when Heidi was walking along the beach as Richard surfed and she kept coming back with rubbish in her arms. They came up with an idea to pick up debris along the beach and put it in their back yard for three months to see how much they would accumulate with the hope of getting a local new paper to cover the story. By the third week they have had collected so much, their landlord insisted they should remove it due to the smell. They eventually came up with the idea of collecting data instead and hence Tangaroa Blue was born.

Tangaroa is the Maui god of the sea with a principle that "If you take care of me, I'll take care of you."

And since both Richard and Heidi spend a lot of time in the ocean, it was a principle that they live by too.

The organization aims to create awareness in communities regarding marine conservation issues by proactively participating and organizing marine conservation projects and activities.

Last year, the organization received a government grant for their efforts. Tangaroa Blue then came up with the Australian Marine Debris Initiative (AMDI) project. The project focuses on the collection of data during beach cleanups, tracking the debris back to its sources and eventually stopping these debris from entering into the ocean in the first place by coming up with feasible solutions that can be used by governments or corporations. Also, part of the project's objective is to work and collaborate with aboriginal ranger groups regarding environmental conservation.

Post media release on the Rocky Point clean up event

Internship Activities

During the course of my internship, I helped with four full beach cleanup activities with local communities and wildlife park rangers (Rocky Point), aboriginal rangers (Cardwell), Marine Park endorsed schools (Lucinda) and governmental department personnel (Farnborough). The activities included preparation for the cleanup, advertisement and notification of the cleanup to get a good turn out, data analysis of debris collected from the cleanup, post media release, identification and tracking of certain items to the source and solution research. I also helped on the post cleanup media release for the Chili Beach cleanup including radio and TV interviews. I assisted with the teaching to aboriginal rangers on how to use the Cybertracker by simulating a cleanup event in the Djunbunji ranger camp. I was a volunteer for a social survey conducted in Port Douglas regarding plastic bags usage in stores as an effort to create a plastic bag free Port Douglas. And lastly we conducted two beach surveys along the beaches of Cape Kimberly and Port Douglas. I also had an additional project to work on which was to research on the weather balloons released in Australia and to find alternative materials or method for the current Styrofoam usage.

Left: Clean up with Great Barrier Reef Park's personnel and Queensland Parks and Wildlife rangers in Farnborough
Right: Education event with Marine Park Schools in Lucinda, Ingham

During some of the beach cleanup and surveys (Farnborough and Cape Kimberly), I managed to collect some plastic pellet samples for my research by staying a few hours longer at the beach and looking for them with the help from Heidi. I also collected pellet samples at Mission Beach, which was along the way as we drove from Port Douglas to Cardwell.

Issues Worked On

Tangaroa Blue focuses on marine debris found on beaches. Under the current AMDI project, aboriginal rangers are considered a significant partner in tackling marine debris issues and its impact to the environment. It has been recorded that about 80 – 90% of all marine debris found happened to be plastic. It has also been documented that plastic debris caused severe impacts to marine wildlife. Considering the severity of marine plastic debris, it has become the main issue taken by Tangaroa Blue. And efforts such as data collection of plastic debris, collaboration with other organizations to study the effects of plastic debris and the spreading of awareness regarding the issue is ongoing.

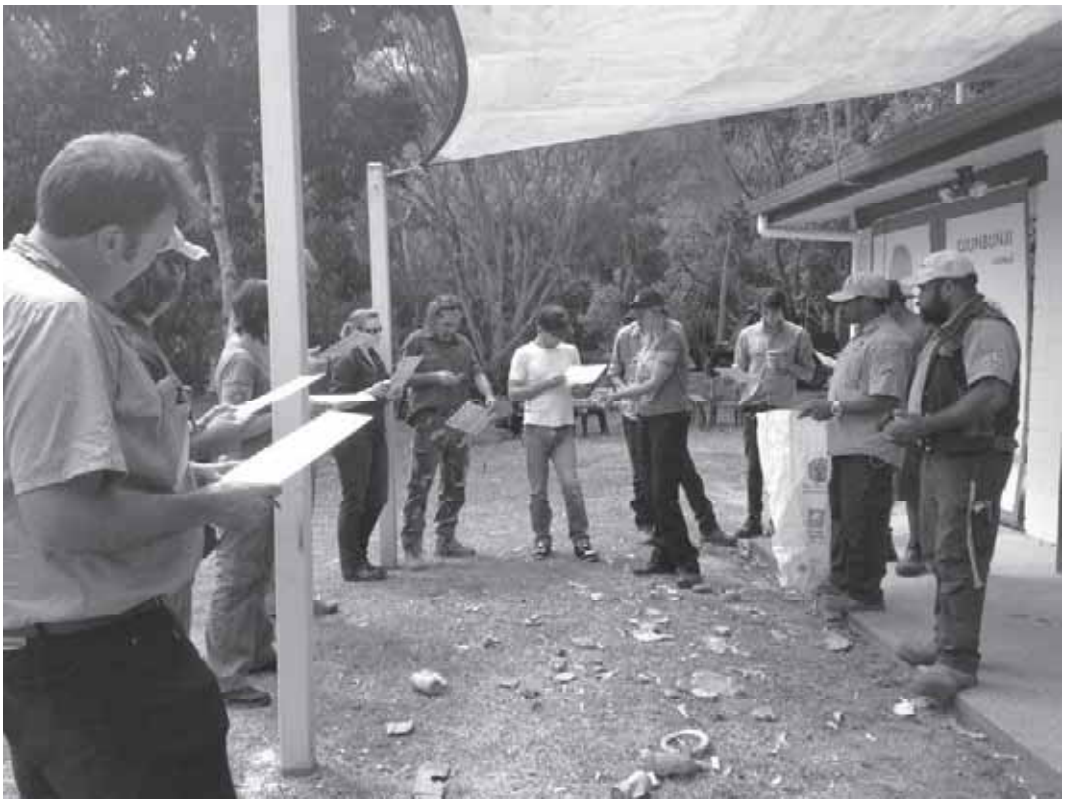
Plastic pollution in the marine ecosystem is no longer an unknown myth but it surprises me sometimes that there are still people out there that are not aware of the issue or simply refuse to believe it. Most of the time, there are businesses or corporations or even government departments who are aware of the issue but do not think that they are posing much threat to the environment. We get hit with sentences such as "It will break down eventually" or "But our plastic are biodegradable". There may be degradable plastics in existence now, but by no means are they biodegradable. They just break into smaller and smaller pieces but remains forever in the environment. These misleading campaigns of biodegradable plastic bags are encouraging more usage of these bags and shall further deteriorate the environment. We hope to spread awareness about this and hope that plastic bags can one day be substituted with reusable, paper, cornstarch or bamboo bags.

Rubbish collected at Port Douglas beach survey over a course of 100 m

We find so many small fragments of plastic on the beach in all shapes, sizes and colours. Sometimes these pieces are so small that it is too difficult to spot or pick up. As we walk along the beach, we cannot help but feel that this is just a peek into our future, and that in five decades or so, the sand on beaches will be substituted by plastic fragments instead. We try to educate people that you do not have to throw rubbish into the ocean or by the beach for it to end up there. Litter anywhere and run off would carry them there for you. Hence, proper disposal of rubbish is just as important.

It was also great to see that rural communities are more proactive in environmental conservation compared to urban residences. There was no need to utilize empathy and the topic of health hazards toward humans. They treasure their wildlife enough that even if we presented no facts on plastic pollutions affects on humans, as long as it was threatening their wildlife, it was enough to call for actions. It made me realize that environmental education and awareness is extremely complicated for it is incredibly subjective and materials, activities and facts have to be prepared specially for each individual, community or group in order for it to be effective.

Finally, networking and cooperation play paramount roles in environmental conservation. But it is never easy to build connections and trust that is necessary in order to ensure a fruitful collaboration. Throughout my internship, I was introduced to, and worked with many parties. From corporations, volunteer groups, government departments, other non-profit organization groups, researchers, park and wildlife rangers, aboriginal ranger groups to media personnel and local stores. And it takes time and effort in order to create a comfortable working environment between parties. Sometimes, we may suffer setbacks such as difference in opinion, priorities and ways of addressing a problem. When working with sensitive groups, we also faced questions, which forces us to discuss sensitive topics.



Working with training rangers in Djunbunji Ranger Camp

Marine conservation covers everything from marine debris to wildlife tracking and health. We can never be experts in everything, thus collaboration between different groups and organizations are always

important. Hence, the setbacks and differences must never stand in the way of collaborations, which could offer much more benefits despite the obstacles. One of the best experiences I had was the privilege of working with the aboriginal rangers. They are truly passionate about their "country" (traditional ownership area) and will do anything to protect and preserve it. But most of them do not have much formal education and are often ignored by educational institutes regarding questions on sample analysis and so on. They wouldn't mind working in the field and collecting data and samples, and would really appreciate feedbacks. This truly inspired me and I gladly offered to consult with them to the best of my ability should they have any technical questions regarding the environment. They have also offered to keep an eye out for plastic pellets and would send them to me as samples. Heidi is also determined to support them and connect them to her network of environment advocates. Because we all have a common passion for the environment, our collaboration shall continue for as long as possible.

Personal Thoughts

There will always be ignorance and evil in the world. But there's also hope, kindness, love and brilliance. There will be times, where we will be faced with dead ends and never-ending problems but sometimes all that is needed is a little help, not too much, just a little and that would make the world a better place is what I observed throughout my internship.

The human race is ambitious, always reaching for the limit to surpass it. We make big plans and expect big results and would settle for nothing less. All of which is good, but sometimes when we turn towards the environment, it helps to be reminded that every little effort helps. And that by just making little changes or by making conservation activities a little bit easier and accessible, we can make all the difference in the world. Environmental efforts don't have to be global or bring drastic changes, but it can start from a community or a single person and grow from there as Heidi has done. And from her, a movement started and it grew and shall continue to grow forward from now on.

Most importantly, I believe that as long as people are aware of the difference they made, the effort will continue and the passion will grow. Working with Heidi for three weeks showed me that people are willing to learn and take time out of their lives to conserve the environment. They just need a platform to do it. Just by organizing these activities, or by making efforts accessible to the communities, would encourage people to participate.

And as I mentioned before, it takes a collaboration of many parties to conserve the environment and I want to be a part of that. I have always wanted to bridge the academic world and the social world of the environmental field. But now more than ever, I want to help provide information and serve people such as Heidi and the rangers who are constantly working in the fields. I want to work side by side with them at times but more importantly be the support they need when it comes to science and technicality. In a field so diverse, there can never be a "we" and "them", only us.

This internship has provided me with a clear idea of what I would like to work towards in the future and how to go about it. The wonderful opportunity of working with people of different age groups and backgrounds has boosted my confidence in communicating environmental facts. And as I communicate what I do in the lab and its significances to others, I become more and more conscious of the passion I have for science and the environment. With that, the communication becomes more honest and effective in my opinion.

Lastly, it’s important to know that conserving the environment doesn’t have to be a serious task, it can be FUN!

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Study on Model test about the Stability of Slopes due to Rainfalls

Pyone Win Win
International Environmental and Agricultural Science Department
Tokyo University of Agriculture and Technology
Host Organization: National Agriculture and Food Research Organization (NARO)
Location: Tsukuba (Japan)
Duration: August 16 to 24

Key words: Preparation of testing apparatus, Construction of slope and Rainfall intensity

1. Activities during the internship

During my FOLENS internship program from August 16 through August 24, in Tsukuba Research Center, I was attached to National Agriculture and Food Research Organization (NARO). The mission of NARO is to focus mainly on the research and development of stable food supply systems, related global-scale issues, agricultural products and foods for new markets and future industries and rural resources.

I got a chance to become a member of NARO to study various environmental problem related research. Among many sectors of their research, I was assigned to observe the slope stability model test on the effect of rainfall intensity together with Head of the Soil Mechanics Laboratory Dr. Toshikazu Hori and other two members. Climate change due to global warming is one of the most concerned issues in the world. Recently, in case of Japan, we have not only larger-sized typhoons but also a lot of local heavy rainfalls with the global warming. A lot of natural or artificial slopes fail due to heavy rainfalls every year in Japan. Not only in Japan but also around the world slope failure problem is very common by the effect of heavy rainfall including my country (Myanmar). Therefore, it becomes more important to investigate the stability of slopes against rainfalls and to develop disaster protection planning.

For my internship, there are three steps I had to learn to complete one model test, such as the preparation and calibration of testing apparatus, construction of slope and rainfall intensity justifying and analysis of model test results. I was taught by Dr. Hori about the slope stability model test. The model slopes used in this test is shown in Figure 1. In this model tests, two materials were used: Kasumigaura-sand and DL clay to construct slope. We constructed the slope with Kasumigaura sand as the subsurface layer of the slope and DL clay as the hard foundation of the slope. The dimensions of slope model are 120cm in height, 42 cm

in crest width, 70 cm in depth and 162 cm in base length. The slope gradient is 45 degrees. At first, base foundation was constructed by compacting DL clay in the maximum dry density. After that, sand layer was laid on the DL clay base. The density is D = 100% in DL clay and D_r = 0% in Kasumigaura sand. After completion of slope construction, we supplied the 50 mm/hr rainfall intensity until slope failure occurred.

During the tests, PWPs (Pore water pressures) were monitored with 18 PWPs transducers. Each transducer was set as shown in Fig.1. To measure the displacements of the slopes, pictures were taken from the side of the slope model using a digital camera. The displacements were calculated by using Particle Image Velocity (PIV) analysis method. Moreover Figure 2and 3 show the auto data logging system and related pore-water pressure transducers. From this model test, we can know the proper procedure of slope protection planning such as water management with suitable drainage system, earthwork comprising of cutting unstable portion of the slope, combination of water management and earthworks. The structure of the whole study is to clarify slope failure mechanism due to difference of conditions (rainfall intensity and subsurface density), model test were simulated using saturated-unsaturated consolidation analysis method with the same conditions and compare the results of practical and simulation.

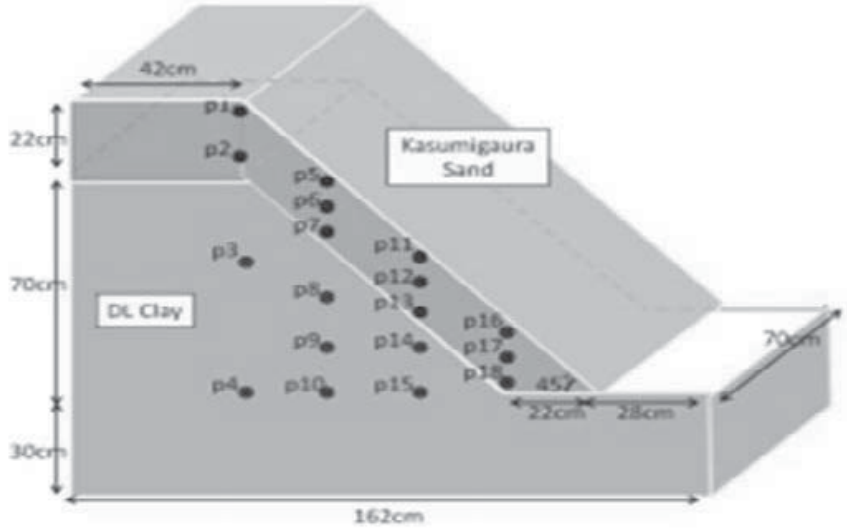


Figure.1. Model slope configuration used in 1 G test

Figure 2. Auto data logging system

Figure 3. Pore-water pressure transducer

2. Experience and achievements resulting from the internship

From this internship I got the opportunity to study a new technology and knowledge about environmental issues solution. I could see various kinds of experimental testing apparatus in NARO, especially for the soil mechanics field. I could observe one of the slope stability model tests and get information about the basic knowledge of slope construction. This experience was the very first time for me to learn about the model test. From these experiences and practices I learnt more about the artificial rainfall instrument which was used to conduct a rainfall model test. I could see the operating system of rainfall instrument. Furthermore, I got information about a digital camera using technique to measure the displacement of soil failure in the slope model. Two digital cameras were used in order to take pictures for calculating displacement. One is Power shot G3 (Canon Inc.), which was putted above the slope and the other one is EOS 30D (Canon Inc.), which was putted in the front of a soil box. Each digital camera was connected with a computer and took a picture by remote control in each position. This measurement technique is also very efficient to get the exact data of the slope deformation due to rainfall.

From our slope stability model test project, there were some interesting observations. My internship program lasted for 9 days so we could not even finish one model test. What I could operate for the slope model test was just the preparation to construct the slope and construction of the slope. Anyway there are many difficulties to do these things if our group had no good unity. But our group could get success because all of the group members were hardworking and eager to get better results. Moreover, our group got great communication with each other and improved language skills in English and Japanese. When we were trying to construct the slope working hard, we supported each other without any exception. It was one of the benefits of this internship program.

To know more information about the slope stability model test due to rainfall, I had read some literatures during my internship. According to literature and my practical works, it can be said that heavy rainfalls led to sediment disasters like slope failures and debris flows. Among victims of natural disasters, the number of victims of sediment disasters account for a considerable rate. Moreover, these sediment disasters

have the potential to occur in various regions in Japan. The sediment related disasters are the most common natural hazard in Myanmar especially near the mountainous area. Sometime due to heavy rainfall slopes were failed and blocked to the road. Under these situations, it is necessary to consider and develop disaster planning that can reduce damages of sediment disasters. Combination of practical training and literature review allowed me for a greater understanding of the heavy rainfall impact on the slope stability. The practical work was very hard and time consuming but I was very interested and it provided me with the opportunity to study not only several new techniques, which can be applied in environmental and agricultural science, but also hints for my future research plan.

My internship program would not have been smooth without the support of my group member, Mr. Anusron Chueasamat; Mr. Shinde; and my supervisor in NARO (Head of the Soil Mechanics Laboratory) Dr. Toshikazu Hori; my supervisor in TUAT professor Dr. Yuji Kohgo and all of the FOLENS teachers and staff. This valuable internship provided me good experience and communication with other members, which are very important things for a community- and field-oriented leader in the environmental sector to get good leadership practices.

3. Relationship between the internship experience and future career development as a field-oriented leader in Asia and Africa

The experience I got from this internship was one of the most meaningful and precious experiences for my life and for my present job as an Assistant Supervisor at Myanmar Agriculture Service, Ministry of Agriculture and Irrigation Department, Myanmar. Moreover, I gained valuable knowledge, skills and experience that will help me to become a leader in the environmental sector. I learned several perspectives on the impact of heavy rainfall and climate change on natural resources and natural disaster. Actually this topic which I learnt from internship is not directly related to my present job. However, during my internship, I got the personal experiences and good communication with other colleagues. This point is very important for my present job because I have to make good communication to share and transfer information on new agricultural technology and environmental issues to Myanmar farmers. In my country farmers and technician communication (friendship) is very important. Before we transfer our technology to farmers, we should have good friendship. If we can build good communication in one village, all of the farmers will accept our guidance about introduction of new technology, disaster protection methods and lecture to farmers about the important of climate change and relate environmental issues. So I will be able to extend the knowledge and ideas from this internship to Myanmar farmers especially about the climate change and natural disaster relationship and how they can maintain the natural resources without harmful impact to the environment.

Moreover, I will extend the invaluable experiences and skills from this internship not only to farmers but also my colleagues. I will encourage all of them to take care about the environmental issues and the conservation of natural resources more than before. My country is a developing country so most of the farmers and other citizens are not so rich with the knowledge of the environment rehabilitation and conservation practices. Therefore I will try to educate new generations to become good environmentalists in the future. Based on this internship experiences, I will also try to improve my own environmental knowledge and ability.

After studying in Japan, when I return to my country, I would like to set up a group of environmental and agricultural awareness and technology extension for maintaining the good environmental condition, together with my colleagues and some interested farmers based on the knowledge and experiences I gained in this internship program.

Figure 4. My Internship place in Tsukuba (Japan)

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Vietnam today, with experience of The Vietnam War

Chihiro Abe
Department of Applied Chemistry
Graduate School of Engineering
Host Organization: Vietnam Volunteers for Peace Vietnam
Location: COMA6, Duong 70, Tay Mo Tu Liem, Ha Noi-Vietnam
Duration: 03 / 09 / 2012 To 16 /10 /2012

1. Back ground

1) Objective

The Vietnam War (1960-1975) has caused destruction and pollution of the natural environment, various diseases, anguish and children with a birth defect related to a chemical weapon named Agent Orange. At the present day, forty years have passed since the end of the Vietnam War.

I have researched about chemical synthesis in my laboratory. Synthesized compounds are mostly useful, but from a different aspect, they infrequently cause destruction and pollution of the natural environment and some diseases. Organic solvent and materials are used in the process of synthesis too. Agent Orange is a type of organic materials useful for killing weeds, but from a different aspect, it causes environmental problems and some diseases. And I always think that researchers should prioritize interests in influences on nature and the usefulness for people over researches. Vietnam was damaged by Agent Orange, chemical compounds. So I wanted to research about Vietnam, a victim country in the field, to think about it and search the direction of my research in the future.

2) Vietnam (VN) [1)]

Vietnam is located in South East Asia. Vietnam covers an area of 330.363 sq. km making it about as big as Italy. Vietnam has a 3400-kilometre coastline and mountainous terrain covers 75 % of the country. There are two huge and fertile river deltas where most population live, the Red River in the North and the Mekong River in the south.


Fig.1 Vietnam

With population of 86,210,860 (July 2008 est.) it is the thirteenth most populous country in the world. There are fifty four ethnic groups and the largest one is Viet (or Kinh) with more than 86 %. Vietnam's former capital was Hue and its current one is Hanoi.

3) The Viet Nam War (The VN War)

The Vietnam War (1960-1975) was the warfare between South VN and North VN ostensibly. But it was actually the warfare between the US, and the Soviet Union and China. In other words, it was the strategic war between capitalism and communism.

～History of the War in Viet Nam ～ [1), 2), 3)]
1840-1842 The Opium War
1882 Occupied by France
1940 The Japanese military came in VN.
1941 Ho Chi Minh organized Viet Minh - purportedly a coalition of all anti- Japanese and French Vietnamese groups.
1946 The warfare between The French military and Viet Minh (The Indochina War) was happened.
1954 The French military surrendered to The Vietnamese one.
1964 The US forces had bombed North Vietnam. (The US had dusted chemical weapon called Agent Orange over Vietnamese fields for about 10 years.)
1973 The cease-fire

The VN War (it's called the American War by Vietnamese.) has some characteristic features. For example, they had a free press (All reporters can enter the fields of the war free.). Many chemical weapons called Agent Orange had been used by the US and it has caused disabled people in VN. Finally, 58,000 US soldiers lost their lives in the War, and VN lost three million victims.

4) Agent Orange (AO)

Agent Orange is a kind of herbicides and they were used as a weapon at the VN War. Most of people call them AO, but weapons the US had used included other types of herbicides called Purple, Pink, Green and White. [4), 5)] The US military dusted them over rice fields, other cultivated lands and forests in order to cut off VN's food supply and eliminate potential hiding places.


Fig.2 Agent Orange

When the VN War started, The US said that AO gives damage to the natural environment, but do not damage human, so the US soldiers touched it with their bare hands. But, as time advanced, the confidence of such information was questioned , because Vietnamese came to have deformed children, and they got illness after the weapon spread. [7)]

First, Federation of American Scientists brought up an issue of AO's risk in 1964. Then Prof. Edsall (1966), Pfeiffer (1966), Mayer (1967), and Dubos (1967) pointed out the problems of AO.[8)]

In addition, K.D.Courtny (The United States National Institutes of Health, 1969) bore out the AO's risk by experiments in mice, and Prof. Meselson (Harvard University, 1970), M.D. Phuong pointed out that Vietnamese children born from a person who had taken AO had a great incidence of getting illness. [4)] And these studies found that dioxins contained in AO caused these diseases. [4)] At last the US stopped using AO in 1970. In the end, total amount of defoliant used in the War was 760,000 L.[4)]

Thirty seven years after the VN War, there are a lot of people and children suffering from the affect of AO in VN (8 million people), the US and Korea. Now, a lot of studies have brought out that AO causes cancer, the liver damage, nerve damage, melanin pigmentation and so on. [4)] And there are some facilities

for AO victims, for example Tu Du Hospital in Ho Chi Minh City, Vietnam Friendship Village in Hanoi, and others. [6), 9)]

2. Activities

1) Interviews

I had interviewed Vietnamese university students and Prof. Vien about present VN experiences following the VN War.

◆Prof. Dong Minh Vien

He belongs to Department of Soil Science, College of Agriculture & Applied Biology, Can Tho University, and has studied aerobic and anaerobic biodegradation of dioxins. He told me his view on present dioxin pollution in VN as listed below.

・High concentration of dioxins in soils were found in former military airbases of Da Nang, A Luoi, and Bien Hoa, which are located in the South and middle part of Vietnam. Many disabled people affected by dioxins were found in areas heavily sprayed with Agent Orange such as Cua Quang Tri.
・There are few studies about biodegradation of dioxins in VN.
・It is too expensive in general to clean up dioxins in Vietnamese polluted hotpots.

◆Can Tho University students and Academy of Journalism & Communication students

They told me their view on present Vietnam as follows.

・The VN government needs to stay coordinated with the US in order to assist victims on the financial front.
・Most of Vietnamese people worry that their children born to have disease affected by dioxins.
・Disabled people in a rural cannot use the facilities in town.

＜Discussions based on interviews＞

I found that Vietnamese students have a lot of interests in the VN war, because some of them voluntarily told me detailed the War history and some places where facilities for victims are, Most of them were interested in volunteer work for the victims. And they said they want to study and help the victims in their future. I was impressed by their wills to lead their country. But, they took no notice of a lottery sales person with disabilities (Although I did not know whether they were affected by dioxins or not.) , whenever they were spoken to by them in town. I thought that I had to ask students ideas about it.

2) Activities in Vietnam Friendship Village

◆About Friendship Village [10)]

Friendship Village is a center for living, health, and education of children affected by dioxins from AO. Founded in 1992 by George Mizo, an American veteran who was interested in helping to compensate for the damage given to the Vietnamese people by the war, and to rebuild VN-US

Fig.3 Friendship Village

relations.

Friendship Village's main mission is to provide a place to live, necessary medical care, and constant supervision to physically and mentally disabled children whose parents cannot care for them adequately due to the severity of their condition, poverty, or the parents' own health-related problems.

Friendship Village complex is composed of two living quarters, two classroom buildings, a health center, and a few other buildings used by the staff for cooking and general administration. It also has an assortment of vegetable gardens.

Friendship Village is home to 130 residents, aged four to twenty six, who come from forty three provinces in Vietnam. The residents' disabilities include autism, cerebral-palsy, Downs-syndrome, physical deformation, and severe mental disabilities.

The staff includes nurses, medical technicians, and therapists, as well as teachers and caregivers.

The Village operates on an annual budget of USD 300,000, half of which is provided by the Vietnamese government with the rest of international aid.

◆My activities in Friendship Village

・Teaching math to children.
・Cleaning the classroom with children.
・Teaching changing of clothes to children.
・Playing with children after class.
・Making the garden.

Fig.4 Children in classroom

Fig.5 A boy studying

＜Discussions based on activities＞

Sometimes a teacher uses violence such as hitting children by a wood stick in order to teach them. At first I was opposed to her educational way. However with assisting her, I had realized that she earnestly thinks about educations for children, so that she gives supplemental studies for severely disabled children after the class. And she said that it was difficult for her to teach children of varied disabled levels.

From these experiences, I thought that Friendship Village managers have to increase teachers for children and add staff to educate the teachers an education of physically and mentally handicapped children in order to make a good environmental for educations of the children.

◆Interview with a director and teacher

○Mr. Long (teacher)

He is a teacher of PC in Friendship Village. When he was a student of Friendship Village, one American volunteer helped him to go to school of IT in Ha Noi City. He told me his view on present VN follows.

・There are few facilities for victims in VN.
・There are discriminations against victims in VN.

○Mr. Dang Vu Dung (Director of Village)

He is a veteran of the VN war. He told me his view on present VN as follows.

・Friendship Village needs connection with some researchers study about dioxins.

・Friendship Village staff　have scarce money to manage it.
・There are no discriminations against victims in Vietnam.
・There are few facilities for victims in Vietnam.

＜Discussions based on interviews＞

Mr. Dung said that Vietnamese people had brought though the VN war together, so they never discriminate against victims. But, Mr. Long had an opposite view to Mr. Dung's regarding discriminations. I thought that there was a distance between young people and old people who experienced the War. So, I thought that old people should tell the young their experiences of the War actively.

3. Conclusion and my future vision based on the internship experience

At first, I intended to interview Vietnamese in general about the VN War, however I was not able to do it, because VN government has controlled some political activities. I realized that I had to prepare for my investigations in consideration of differences of environment between VN and Japan.

There were a lot of foreign volunteer members including me in Friendship Village. We had tended to force our ideas and styles against Vietnamese staff. However I had learned that it was important for us to fit in and understand Vietnamese custom by my activities in Friendship Village.

Sometimes some tour members from foreign countries visit the classes for a brief time and give the children snack, candy and so on. When the members visited there, the children delighted in snack and candy. But after their staying, a lot of garbage had been left there, and the teachers had to clean the class room in their busy schedules. By my experiences, I learned that we have to consider really-required supports at an actual place.

I had been studying only bad effects to the Vietnamese people by some chemical products by some references before this internship. Though, I found that the children in Friendship Village have not care the bad effects, and study, play and live with their hearts and souls every day. By this experience, I found that it is important to consider how to make happiness than cover the bad effects by chemistry.

I have had love for the children by my activities, and I want to solve the environmental problems strongly. All of companies and universities have set a goal of solving the problems, for example, making environmentally preferable materials. But I think that they can never solve the problems without love for people, the world and so on. And I think that love for someone is created by relationships between people. So I want to make opportunities for company members to inter-act with others like this internship and make atmosphere for truly solving the problems in my future.

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5. Acknowledgment

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Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

International Cooperation in an Environmental Sector by NGO

Rina Kurumisawa
Department of Environmental Science and Biosphere
Graduate School of Agriculture
Host Organization: OISCA International
Location: Fiji
Duration: 2012.9.7~2012.9.26

Key words: NGO, Environmental conseravation, organic farming, marine environment, environmental education

1. About OISCA International and OISCA International Fiji

OISCA International has long history of consulting on human resource cultivation through rural development and environmental conseravation since 1961.

In Fiji, they started their activity from human resource cultivation through agricultural training at National Youth Training Center (NYTC) as requested by Fijian government since 1990.

Then they have been expanding their activity to environmental conseravation like “Children’s Forest Program” (since 1992), “Mangrove Reforestation Project” (since 1995), “Coral Reef Restoration Project” (since 1997).

In agricultural training, they are teaching organic farming skill from Japan, at the same time they are teaching discipline through well regulated life at NYTC to young trainees. The characteristic of agricultural training in Fiji is that they are cooperating with Sigatoka Town Council. The staff of the town council lead the people at the town market to segregate wastes and raw garbage to NTYC, then trainees make compost from raw garbage in training. OISCA Fiji educated more than 600 trainees so far, and 120 of them received a chance to learn more advanced skills at OISCA training center in Japan.

OISCA Fiji has planted about 764000 trees through “Children’s Forest Program” since 1992. They have also planted mangrove with community people through “Mangrove Reforestation Project” and more than 54300 corals in “Coral Reef Restoration Project” Through these activity and workshop, OISCA aims to raise of environmental awareness of Fijian people.

2. My activity during the internship

My activity during internship was mainly joining programs and deskwork.

OISCA staff gave me many chances to understand about international cooperation and the life and culture of Fiji. In addition to the activity of OISCA, I also met many people around them (village people, JOCV, JICA officer..), participated in the traditional wedding party there, joined the ceremony for a new baby, joined a Sunday church service…..and so on.

Thorough my internship in Fiji, I could understand there were different standpoints, opinions, attitudes and hardships among people who are involved in international cooperation.

Agricultural training:

In agricultural training, I experienced organic farming together with Fijian trainees. My schedule was limited so I just experienced one part of organic agriculture but it was enough to feel how hard and difficult it is to do organic farming. I helped soil packing to small pot. They used river soil mixing with compost. First we broke a clod of river sediment, remove weed and root and mix with compost. We packed this soil to small hundreds of pod for seedlings. It took about 2 hour for 10 people.

Not only cultivation but also sales is their training. They sell their vegetables to a near market, and a hotel's kitchen.

Picture 1. Trainees of NYTC. They are taking care of seedlings.

Mangrove reforestation program

I joined this program at Komave Village and Navola Village.

They started this activity from collecting seeds from other places where many mangroves grew. And they started raising seedlings in the village. After growing them enough to move from the pot to the beach, they transplanted it at 1m x 1m intervals in about 20cm depth holes. At some area of the beach, many rocks made it difficult to dig a deep hole. And seedlings were heavy so that it was tough work. But Procedure was very simple and children, women and senior people including the village chief joined this work. But some of the planted mangroves were swept away by waves, so staff and villagers try to find a good way in their process of trial and error, like putting two seedlings into one whole.

Picture 2 and 3. Mangrove reforestation program at Navola Village. Many village people joined OISCA's activity.

Coral restoration project

I joined their coral conseravation activity at Vatukarasa Village, Valase Village, Vunaniu Village. I heard that they take different methods for settled planting of corals according to the conditions. One of these methods is picking up cracked corals on the bottom of the sea and set corals on the rocks by using U shaped nails.

It was warm for winter but it was have a bit chilly way, after thirty minute activity our body was shaking. And activity was done under the sea so that our body was tossed by the waves, and sometimes I hit my hand by a hammer and mistakenly hit and broke corals. They set a safety guideline and this activity was a bit difficult.

Vatukarasa village is the last village that still continues harvesting corals in Coral Coast. It took a long time for carrying out discussions with villagers again and again for launching this. I wondered how villagers felt after they experienced the difficulty of protecting corals whereas harvesting (destroying) them is easy.

Picture 4. Village people is planting mangroves

Picture 5. Around the regenerated corals, fishes came back

3. Back ground of OISCA Fiji's activity

Agricultural training

The increasing number of young people who don't have a job is one of the problems in Fiji. To solve this problem, Fijian government set up National Youth Training Center (NYTC) as a work-skill training institute. For further improvement, Fijian government asked for support from OISCA because OISCA had abundant experience of the capacity building for rural development in other countries. OISCA then introduced a capacity development program through organic farming activities at NYTC, valuing the importance of organic farming for environmental conservation. And their activity started.

I asked some trainees whether they wanted to be an organic farmer or not. They are learning both methods organic and conventional farming, so that they know how hard it is to do organic farming. But all told me yes, because they believed organic farming is good for the environment and health. But staff told me the actual situation in Fiji is severer than Japan. While some of the graduates try to start organic farming in

their home, for some problems like pests, consumers' awareness and so on, they cannot continue pure organic farming and in some part they use chemicals. So now the organic farming is good when people make vegetables only for their family or community but they haven't establishes organic farming as a business yet in Fiji. So now is the first stage for spreading organic farming in Fiji.

And they started their new attempt related to agricultural training with town council, they gathered raw garbage at market, transport to the OISCA farm and they use them for their training for making compost. Because increasing amount and variety of garbage is one of the major environmental issues in Fiji. Furthermore, segregation is not a common practice, so all the garage is dumped together in this small island. So, JOCV staff of town council leads people to segregate garbage at market and after segregation OISCA use them for organic farming. This is a good example of cooperation between an NGO and other actors.

Environmental conseravation activity

We have an image that Fiji has rich and clean nature, but recently they have many environmental issues, such as the increasing damage from cyclones possibly caused by climate change, environmental destruction by tourism development and other commercial activities.

At the south shoreline of Viti Levu Island (the area called Coral Coast), corals are destroyed due to the resort development, soil erosion, fishery nets, and so on. Another cause is the use of dynamites by the village people for harvesting corals. It is one of the well known places where corals are decreasing in the world. So now only a few corals remain in the Coral Coast. In this area fishes are also disappearing and this is one of the serious issues especially for fishery.

And another problem in coral coast is the destruction of mangroves. The mangroves prevent soil erosion at the coastlines and river banks, but now soil erosion is a serious issue especially for the coastline villages. Furthermore, those soil covered corals and this became one of the reasons of coral's death.

4. My future plan

I watched OISCA staff's work (how they work, what is the difficulties and so on) for three weeks and I thought following things.

When we think about environmental issues in a small area, the natural condition, social structure, law, customs and culture, the people's attitude to environmental issues……and so many factors around there vary from place to place. Therefore, I thought that we have to find and take applicable solutions for each place.

I think following abilities are needed when we work for environmental issues: Knowledge about not only environmental issues but also social issues, negotiation skill and ability to persuade others to understand how important it is to tackle environmental issues, reliability to be accepted in the different culture and society, a sense of integrity to gain reliability, flexibility to find tailored approach to the goal depending on the situation.

Among these I felt that the most important and difficult one is how to persuade people to understand the importance of protecting the environment. I found an example to show this difficulty in OISCA's activity. After planting trees for children's environmental education, some foreign company came to cut down those trees and paid the villagers a thousand yen per truck. The staff discussed about it and the main point of it was how to persuade the people to understand the importance of protecting the environment. Especially in developing countries they tend to pursue the economic and social development, but we know the importance of environmental conseravation in those countries so we should try to emphasize those things again and

again.

In my future, I may face these difficulties in my work for JICA. But from this experience and studying in my internship for OISCA, I got some important way of thinking for my work in the field of international cooperation.

Lastly I would like to thank OISCA, Mr. Sugawara and Ms. Jojo for providing me this opportunity in spite of my staying there was too short to work for OISCA, and also for all the support for me. And I would like to thank FOLENS to providing me this opportunity. I could gain valuable experience through this internship for my life.

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Volunteer Work for Healthy and Sustainable Environment

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Department of International Environmental and Agriculture Science (M2)
Tokyo University of Agriculture and Technology
Conservation Volunteers Australia
Location: Centennial Parklands Depot Banksia Way Centennial Park (Depot Road) NSW 2021
Duration: March 28 – June 4, 2013
Key words: Conservation, Volunteers, Environment, Native, Healthy, sustainability

1. Description of the host Organization

Conservation Volunteers Australia is a Non-Government Organization founded in 1982 in Ballarat Victoria, it has grown into Australasia's leading practical conservation organization with offices across Australia and New Zealand. Now they already have built 24 offices during the first 30 years. In 1986, Conservation Volunteers undertook 5,000 volunteer days; they now manage more than 100,000 volunteer days a year. The Conservation Volunteers plants more than 1 million trees a year, and complete more than 2,000 projects a year. The projects are managed in conjunction with project partners that may include regional councils, national parks, museums, land care groups, conservation departments and other national conservation agencies. The main projects are Wild Futures, Flora & Fauna, Land care, Parks & Reserves, Coasts & Waterways, Healthy communities, Heritage, Disaster recovery projects.

Conservation Volunteers was founded when discussion of environmental issues was fresh, vibrant and a touch radical. It was also a different world' from today's.

Conservation Volunteers welcomes people with a love of the outdoors and interest in the protection of environment to build healthy and sustainable world. No matter who you are, no matter without any prior skills or experience, in fact, anybody can get involved. (picture1)

2. Activities during the internship

During the course of my internship, I had participated with three full kinds of project work with international conservation volunteers and local volunteers in New South Wales and Victoria area. The locations were Newcastle, Canberra, Bellingen and Melbourne. The projects included planting, cutting, beach cleanup. The Planting project was for planting local native plants in various national parks and a rainforest area; the cutting project was for cutting down non-native plants in the local area, some national parks and in a rain forest area; the beach cleanup project was for cleaning rubbish on the old beach and busy

beach.

1, Newcastle, New South Wales

I had three kinds of project with other international volunteers and local volunteers for four weeks in Newcastle. There were Cutting project (castor oil plants), Planting project (old beach, cattle farm, national park), Beach cleanup project. (picture2)

Castor oil plant originates in Africa, now is widespread through the tropical and subtropical regions of the world. Seeds of castor oil plant spread by rodents and birds, on mud adhering to boots, on vehicles and machinery and by floodwaters. Taller plants can throw their seeds over five meters from the mother tree. It grows very quickly and the roots extend to other plants' area. Australian people advocate conservation of native plants and clearance of every non-native plant. We hand- pulled the young ones and cut the big ones for controlling them. We also had a planting project in the national park for protecting wild life, especially the birds. Australia is home to some of the most incredible wildlife and plants on the planet. Changes to the landscape as a result of human activity have put many of these unique at risk. Since European settlement many species of birds, animals and plants have already become extinct. I also had a beach cleanup project for building a new beautiful and clean beach. The project included preparation for the cleanup, cleanup of rubbish on the beach and from the bushes near by the sea. We also pulled out the some non-native seaweeds and planted native seaweeds (pig face) in the same area for building the healthy and sustainable environment.

2. Canberra

I had two weeks project for cutting poplars, hawthorns, and brooms (we called it "Chop Chop Project") and planting activity with other international volunteers and local volunteers in Canberra. They were also for to keep and protect local native plants and to control the erosion of waterside banks. (picture3)

3. Bellingen

I also had two weeks project for cutting Lantanas, clearing privets and planting of native plant.

Lantana is a big problem in Australia. Lantana might looks like a strikingly attractive plant and in some respects the foliage and flowers are quite beautiful. The species is a genus of the verbena family, native to Mexico and South America. Lantana is a problem because it forms a dense thicket. It usually invades disturbed land and river margins, particularly open, sunny areas. Given the right conditions, it spreads quickly. Lantana is releasing chemicals into the surrounding soil to prevent seed germination, notably of the native flora, so that it eventually takes over native bush land. As with other successful weeds, lantana can spread in different ways. It layers - that is, it produces roots from where the plant touches the ground, and that produces new plants. But more importantly it's propagated by seed. These are ingested by birds and foxes, which spread them through their droppings. This means it can spread over a distance very quickly. But perhaps more importantly, it can produce up to 12,000 seeds from one plant in a year. No wonder it has become a problem weed. So it is now known as a weed of national significance and is regarded as one of Australia's worst weeds. It is invasive, it has potential to spread and it is impacting on the economy and the environment. (picture4)

Lantana is already well established on the east coast of Australia. The best method of control is to prevent its further spread. To get rid of large areas of lantana you might need to use herbicides, though you could try mechanical removal. Biological control has been tried, however the controlling bugs and beetles vary in their effectiveness, partly because lantana drops its leaves when stressed, leaving the bugs with no food. In this project we had cut down the lantana and planted the local native plants (bangalow palm, river oak, celery wood, yellow carabeen, brush chery, gian water gum, weeping lilly pilly, bleeding heart, foam bark tree, brush box, white cedar, white bolly gum and water gum e.tc.) in the same area.

We also cleaned up the Privet in the rain forest area. When water washing coming in the rain season, the non-native plants such as Lantana and Privet are washed away with the water to influence the water quality and kill fish. Local people want to plant more local native plants to hold soil and protect river to build the healthy environment. They have very strong water washing two or three times a year, that is why they need such as planting project every year.

4. Melbourne

I had a one week project for planting in Melbourne. We had planted local native plants in some national parks and planted seaweeds on the beach. I also had an additional work to work on which was to cleanup beach before planting. Because we found there were lots of plastic rubbish (juice bottles, plastic containers of fast food, cigarette ends e.tc.) on the beach. (picture5)

About my interview

During the project work, I had interviewed some local volunteers, project team leaders and staff of national park. The questions were such as: why they join volunteer project; why we need such kind of project and information about the targeted plants.

As a result of my interview, I found that most of the local volunteers are older peoples and they join this organization for part time job, of course some of local volunteers for volunteer work. I also found the main reason of the project work is for plant more native plant to build health environment.

Weekend study

Every week we worked for a project from Monday to Friday, and they had to change international volunteers on every Friday. Weekend is free time for us to study, to visit a local area and to communicate with other international volunteers. I have visited the Australian National University, Melbourne University and some botanic gardens.(picture6)

3. Personal thoughts

Human has very high speed of advance and development. We will make high and new technology and new modern world to future. But on the other hand we have also consumed a lot of resources and brought many kinds of problems including over population, environment problems and so on. Should we just satisfy immediate demand or consider for younger generation? What is sustainability? What is healthy development? We should think about them when we develop underground resources, when we cut down trees, when we walk on the beach, when we enjoy the scenery near the sea. It needs a little attention, needs a little time and needs a little activity to build a healthy and sustainable environment for the future. This is what I observed throughout my internship.

We know environmental problems already have been global issues, occurred in any country. But I think nobody wants to make it more seriously, nobody wants to get any effect from it. Hopefully, environmental efforts don't have to be global or bring adverse circumstances. So what should we do now? Where should we start? I think we just start from the little things. We should pay attention to the small things and take care of small things. Don't think it is very little and small, many small things accumulate to form the whole world. We should pay attention when we throw rubbish on the street or on the beach; please take care when you see a bird or fish; please turn the tap off completely when you finish washing. All of which looks very easy and very simple, but when we persist in doing every day you will change your world to be healthy and sustainable.

Australia is a developed country and has rich natural environment. Australia not only has a lot of

experience in dealing with development-related social problems, but also they are planting more and more local native plants to build the sustainable environment. Working with Conservation Volunteers Australia and local volunteers for nine weeks I have found that people in Australia have very high consciousness and many activities for the environment conservation. My internship did not only show me the importance of weed control in order to help maintain native species survival in the wild, but also showed me the willingness of people to learn and participate in activities to conserve the environment. Conservation Volunteers Australia organizes people and gives them a platform to do it. It will encourage more and more people to participate.

After internship I have found some connection between what I learn in the lab and my conservation volunteer experience. I now pay more attention to the environment conservation activities and have been more and more interested in environment science. Working with people of different backgrounds and different age groups was a good chance to learn more information and communicate about environmental problems.

Lastly, I would like to tell everyone that we need to build the healthy and sustainable environment and if we want to enjoy our life, we should start now!

P1, The CVA office in Canberra

P2, Beach cleaning

P3, Cutting Hawthorns

P4, Cleaning Lantana

P5, Planting project in Melboune

P6, Australian National University

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Community Development Based on School Education
A Case Study in Khao Noi Village, Phitsanulok, Thailand

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School of Renewable Energy Technology
Location: Phitsanulok, Thailand
Duration: Six months

Key words: renewable energy, community development, rural area, education

1. Introduction

1.1 What and where was my internship?

School of Renewable Energy Technology (SERT) of Naresuan University is the institution which is developing renewable energy technologies. The school is studying about energy generated from such natural resources as solar, biomass and hydro power. Like other countries, Thailand also has shortage of energy so that its government is promoting research and use of renewable energy. The institution is not only researching renewable energy technologies but also trying to install these technologies in rural areas as a method of community development. In Khao Noi Village, Phitsanulok province, Thailand, community people are trying to develop the community, through what is called Khao Noi Project, to promote renewable energy working with SERT and non-government organization, Community Development Association. The method of the community development is “community based learning”. First, the technology is passed to schoolchildren at Wat Khao Noi Primary School, and then, new knowledge and technology are passed from pupils to community people.

Fig.1. the sign of SERT

My internship purposes were

- To understand Thailand’s trend in renewable energy
- To understand rural area in Thailand especially about lifestyle, school education and community development

- To understand the mechanism of community development based on primary education in Khao Noi Village

1.2 What are environmental and economic issues in Thailand?

In 2011, Thailand GDP was 345.7 billion, its population was 69.52 million and poverty incidence was 13.15 %. According to 2011 GNI per capita, Thailand is now regarded as one of the upper middle income countries. Although Thailand has enjoyed steady development and poverty has kept falling, 88 % of the country's 5.4 million poor are living in rural area (The World Bank). As regards energy, energy self-sufficiency was 60% in 2010 (The Institute of Energy Economics, Japan), and this rate was smaller than that of other Asian non- OECD countries such as India, China, Indonesia and Malaysia (Yokozuka et al., 2011). Therefore, Thailand imports electricity from adjacent countries. However, because Thailand has historically complex issues with surrounding countries, Thai people concern about stability of energy supply. Addition to that, as other countries in this world, Thailand has recognized problems such as environmental problems and depletion of energy resources and been aware of an importance of alternative energy. Therefore, renewable energy is in the spotlight in Thailand and its government is trying to promote the substitute. In this tide of increasing concern to energy and community people's wish to develop Khao Noi, core members of Khao Noi Project decided to install renewable energy in Khao Noi as a tool to develop the community by getting help from Thailand government. Before community people started Khao Noi Project, they needed to buy such fuel as LPG and charcoal. Therefore, they expected that by introducing biogas, they could supply energy by themselves and, moreover, it would reduce environmental burden because they would not need to buy LPG from remote area and reuse local resource such as feces from cows and buffalo. They also started to make better quality charcoal, charcoal briquettes and gas stoves not only to use by themselves but also to sell to other regions.

2 What did I do during the internship?

2.1 First Half of My internship from April to July

Through my internship, I went to Kaonoi and Wat Khao Noi Primary School. For the first half of the duration, there were two objectives. First, I visited Khao Noi in an attempt to explore rural lifestyle in Thailand. Second, I tried to understand trend of renewable energy in Thailand. To achieve them, I stayed in Kaonoi and experienced nepia grass planting which was becoming new business in this community. I also visited the school and taught English to know school life and pupils in rural area. I taught English three days a week in July. When I worked as an English teacher, I stayed with Principal's family so that I also could compare children's lives in rural area with that of urban area.

2.1.1 Life in Khao Noi Village and School Life at Wat Khao Noi Primary School

The Village had around 220 households. Around 50 households used biogas, and they did not have to pay for gas at all. They were proud of their biogas and mass media and people come to Khao Noi Village to learn about Khao Noi Project. However, traditionally Thai people preferred to use charcoal when they

prepared dish. Therefore, Khao Noi Project introduced drum kiln to make higher quality charcoals and get wood vinegar.

About kitchen, everyone even strangers could use it without asking permission. When they worked at field, they brought lunch boxes, which were called Binto in Thai language, and they shared dishes with coworkers. Sharing dishes was seen at the school, as well. It seemed that Thai people shared wider range of things than Japanese.

In Khao Noi Village, in order to increase income, some community people planned to grow napier grass and sell it to an electricity company. This is a new project for them and they said that if they could promote it, they could have an alternative energy resource instead of LPG.

At Wat Khao Noi Primary School, I joined several activities. One of them was planting vegetables at the school garden. After they grew them enough to eat, they would eat them at lunch. During this agricultural class, for example, they learned how to plow and the appropriate distance between each furrow. They could also learn how to cooperate with and treat others thinking differences of personality, age, and physical strength. Pupils also made a field trip to farms in the neighborhood to experience napier grass planting. They eagerly helped farmers to plant napier grass and asked questions to a teacher. Letting pupils have these agricultural experiences was one of Khao Noi Project.

At the school I mainly taught English to pupils of the fourth and fifth grades. They liked studying and speaking English. Some of the fifth graders voluntarily studied English after school and tried to speak to me holding an English-Thai dictionary.

2.2 Second Half of My internship from August to September

Based on understanding which I got by spending times in Khao Noi Village and the school, during second half of my internship, I conducted survey about Khao Noi Project, which means the community development based on Wat Khao Noi Primary School in Khao Noi Village. In order to identify the mechanism of Khao Noi Project and prospects of community people toward the Project, I interviewed the principal who was one of core members of Khao Noi Project, had a focus group interview with community people who actively joined the community development activities, and conducted questionnaire survey for participants and pupils.

2.2.1 Prospects of Khao Noi Project

Khao Noi Project was started by Principal, Mr. Amnaj Tinamat. He asked Mr. Chart Chaiyasit of Community Development Association (CDA) which was NPO in Thailand for its support. And then, because Mr. Tinamat wanted to introduce some technology into the community, they got a technical assistant from Dr. Pisit Maneechot, who was a lecture of SERT. Mr. Tinamat, Mr. Chaiyasit and Dr. Maneechot decided to put Wat Khao Noi Primary School at the center of Khao Noi Project and thought that the school should be the center to spread new knowledge and technology through the community. They also wanted the community to realize the importance of energy conservation and environmental issues. In line with these ideas, they started activities and after about five years passed from the start, now Khao Noi Project was composed of two elements, School Activity and Community Business. School Activity had mainly five fields; agricultural activity, biogas, gas

stove, charcoal and charcoal briquette. As an expansion of School Project, Khao Noi Village had several community businesses and they were selling charcoals, gas stoves and charcoal briquettes, and other new business related to renewable energy evolved.

Fig.3. Prospects of Khaonoi Project (Source: Author made)

Following were opinions from core members of Khao Noi Project. About School Activity, they believed that the school should teach pupils two kinds of knowledge, basic education and life skills. First, basic education enabled pupils to pursuit higher education and get better life in urban area. They expected that after getting higher education, some of the young might come back to Khao Noi Village and their knowledge could be other impulse to further community development. Second, they also believed that all pupils should get life skills to live in rural area such as farming and getting fuel by themselves because they noticed that although some people who moved to other area wanted to come back to Khao Noi Village, they could not settle down in the Village because they were lacking in skills to live in rural area. Therefore, they wanted to ingrain basic skills to live in rural area in all pupils regardless of whether pupils wanted to stay there or not. They also expected in the future the young who learned agriculture at the school would develop agriculture of Khao Noi Village. However, not all of the pupils realized the importance of learning agriculture and some were reluctant to learn it at their homes. Therefore, community people thought that the school could give agricultural lessons to pupils evenly and effectively. When the school taught agriculture, community people came to the school and taught or pupils went to farmlands. They believed that because of the energy crisis, having a mind set for energy conservation was necessary not only for pupils but also for all of adults in Khao Noi Village. If adults realized the importance of energy conservation, they could save expenses, and in some cases they could increase income by joining community business. These community businesses could further facilitate community development in Khao Noi Village, as well. Addition to that, money made by saving expenses or increasing income would make it easier for parents to support their pupils to get higher education.

2.2.2 Mechanism of Khao Noi Project

Because Wat Khao Noi Primary School was the center of the Project, all of new knowledge, technology and, in some cases, funds were first passed to the school. And then, the school taught pupils academic knowledge, life skills and an importance of energy conservation. Pupils were learning life skills from making charcoals, learning a mechanism of gas stoves, practicing agricultural activity at the school garden or as field work, using biogas to make lunch at the school and taking part in charcoal briquette production. Although sometimes community people were invited to join some activities and they could learn new things at the school, the core members also put high value on pupils' role to spread new knowledge and technology. They hoped that by seeing or listening to what pupils were doing at the school, parents would be moved to join the activity. Parents who approved the School Activity supported it. Some donated seeds and plants to the school for its agricultural activity and others shared their agricultural or engineering knowledge freely with other community people or pupils at the school. In case of community businesses, the school, specifically, the principal played an important role and Mr. Tik worked as a middleman. For example, He gathered information, brought and sold products at the market and negotiated with others.

Fig.4. Mechanism of Khaonoi Project (Source: Author made)

3 Conclusion

One of Khao Noi Project's goals was to ingrain the mindset of energy conservation in all community people. This Project was, to some extent, successful to let people think about energy and guide them to use substitute such as biogas. This community also could help other community by showing what they were doing. Moreover, some of community people started new business thanks to Khao Noi Project and it might help them to increase their income. Khao Noi rojProject also taught environmental issues such as global warming to pupils.

However, it seemed that they failed to make the most of the opportunity to teach pupils environmental issues and conservation. Perhaps, they just might not have sufficient facility or information to make right decisions, so, for example, they burned rubbish including plastic bags at the school. Therefore, what we can do for them might be passing information on what our lifestyle causes to the earth and how we can live environmentally friendly. It could help pupils to become better-rounded in Khao Noi Village and it would eventually have an influence on their parents' lifestyle. Pupils at the school were knowledgeable about nature of Khao Noi Village and keen on learning. If they understand more of relation between nature and their lives, they could understand the importance of thinking about environmental issues more. It would help Khao Noi Village develop in a more environmentally friendly way. We also can find opportunities to tell companies what condition rural people in developing countries are under and, it would help them to produce environmentally friendly products not only for developed countries but also for developing countries. From this internship, I learned the ordinary for me was not for other people because culture, history, custom and education were different. I learned that these differences were also causes of environmental problems. This is a good lesson for me that when I talk with people, especially people having a different background, I should accept differences positively to understand and move on.

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Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Management system of CO_2 and H_2O flux measurement in Kiryu (Japan), KogMa and MaeMo (Thailand) experimental forest

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International Environmental and Agricultural Science (IEAS)
Name of Graduate School: Agriculture
Host Organization: Faculty of Forestry, Kasetsart University in Thailand, Tokyo university, and Kyoto university
Location: Japan and Thailand
Duration: 2013.05.27～05.29 (Kyoto)
08.06～08.19 (Thailand)

Key words: forest, CO_2 uptake, internationally collaborated management system, multi-disciplinary measurement system

1. Activities during the internship

During this internship, I had the opportunity to be a member of a research group that consists of Tokyo University, Kyoto University, Mie U**n**iversity in Japan and Kasetsart University in Thailand. They have been conducting leading investigation on water and carbon cycling and ecological system of forest in Kiryu (Japan), KogMa, MaeMo (Thailand) and so on.

First, I visited the Kiryu site from May 27 to 29 and learned a long term management system of the EC (eddy covariance) method (Fig. 1. (A), (B) and (C)). The EC method is one of the standard methods for examining the flux in relatively large areas (few hundreds to millions of square meters). The site was established in 1967 and the EC method has been conducted for 14 years (since 1999) in Japanese cypress and cedar forest by Dr. Kosugi of Kyoto University. It is one of the sites where measurement has been conducted for the longest period in Japan. Indeed, in my master program, I have been working on the evaluation of CO_2 and H_2O fluxes of steep Japanese cypress forest by using the EC method. Therefore, it was a very precious opportunity for me.

Second, I visited Thailand sites, KogMa and MaeMo. In these two ever green forests sites, Multi-disciplinary researches have been conducted such as monitoring of flux and tree physiology. These researches have been under the international collaboration by Japanese researchers group and Kasetsart University. It is the only university that has faculty of forestry in Thailand. Followings are local collaborators, Dr. Chatchai who is a counterpart at Kasetsart University, Ms. Ei who keeps the experimental forest and students lodging of KogMa and also arranges an extra driver, Mr. Swang who was a FIO (Forest Industry Organization) worker

at MaeMo but now engages in collection of data requested by Japanese researchers such as rainfall and leaves data in MaeMo with his son, and Mr. Ming who is a driver. Japanese researchers employ Mr. Swang, his son and Mr. Ming.

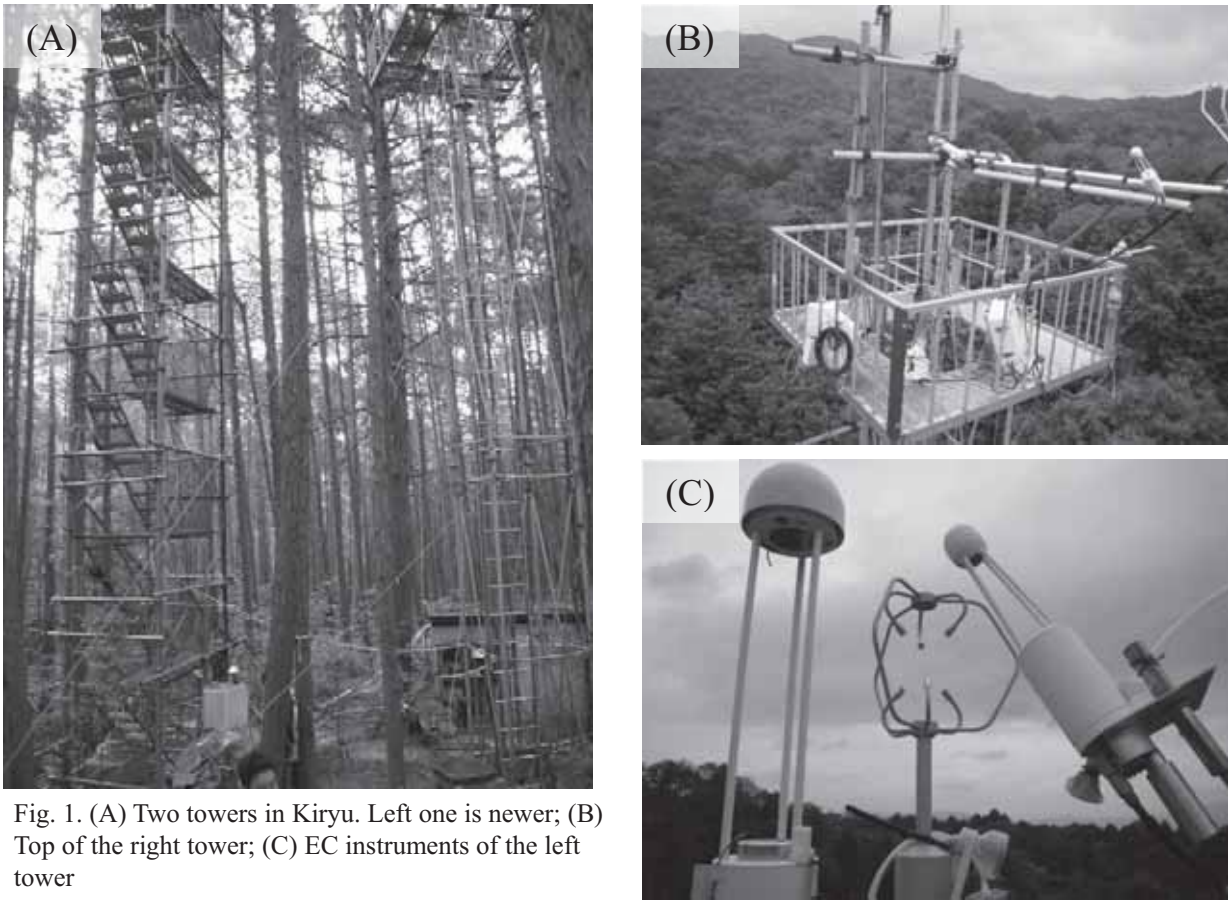

Fig. 1. (A) Two towers in Kiryu. Left one is newer; (B) Top of the right tower; (C) EC instruments of the left tower

KogMa site is an experimental forest of Kasetsart university and located next to a national park in Chiangmai (18 ° 48 N, 99 ° 54E, 1265–1420 m above sea level). Typical species are *Cinnamomum porrectum, Lithocarpus elegans, Castanopusis acuminatissima* and *Schima wallichii.* A 50m flux measurement tower was built by Japanese researchers in 1996, and observation started in 1998. I visited KogMa site from August 7 to 8. There, I assisted Dr. N. Tanaka of Tokyo University studying fog on the tower and Ms. Ei with safety checking of the tower. Specifically, the tower was a little distorted because safety wires of the tower got pressure from some liana (Fig. 2. (A)). Besides, two fallen trees lied in a road to the tower (Fig. 2. (B)). To check on the damage, Dr. Tanaka led Ms. Ei to all problematic wires and discussed the way of removal.

On the other hand, MaeMo site is a teak plantation (*Tectona grandis Linn. f.*) established in 1968, in Lampang province, northern Thailand (18 ° 25 N, 99 ° 43E, 380 m above sea level, Fig. 2. (C)) managed by FIO MaeMo branch office (Fig. 2. (D). Teakwood has high market value and thus teak plantations have been widely established throughout the tropics in Indochina and India (Krishnapillay, 2000). Until the 1960 - 70s, drastic decreases in forested area had occurred in SE Asia. Recently, however, forest rehabilitation and plantations have been increasingly promoted in the region (Igarashi et al., in press). In recent 4 or 5 years, FIO exported timbers to Singapore and India. As described above, Kasetsart University is the only university that has faculty of forestry, so all of the chiefs and sub chiefs of FIO are graduates of the university. Therefore, it was relatively easy to get permissions for cutting trees and so on for our researches in the forest through Dr.

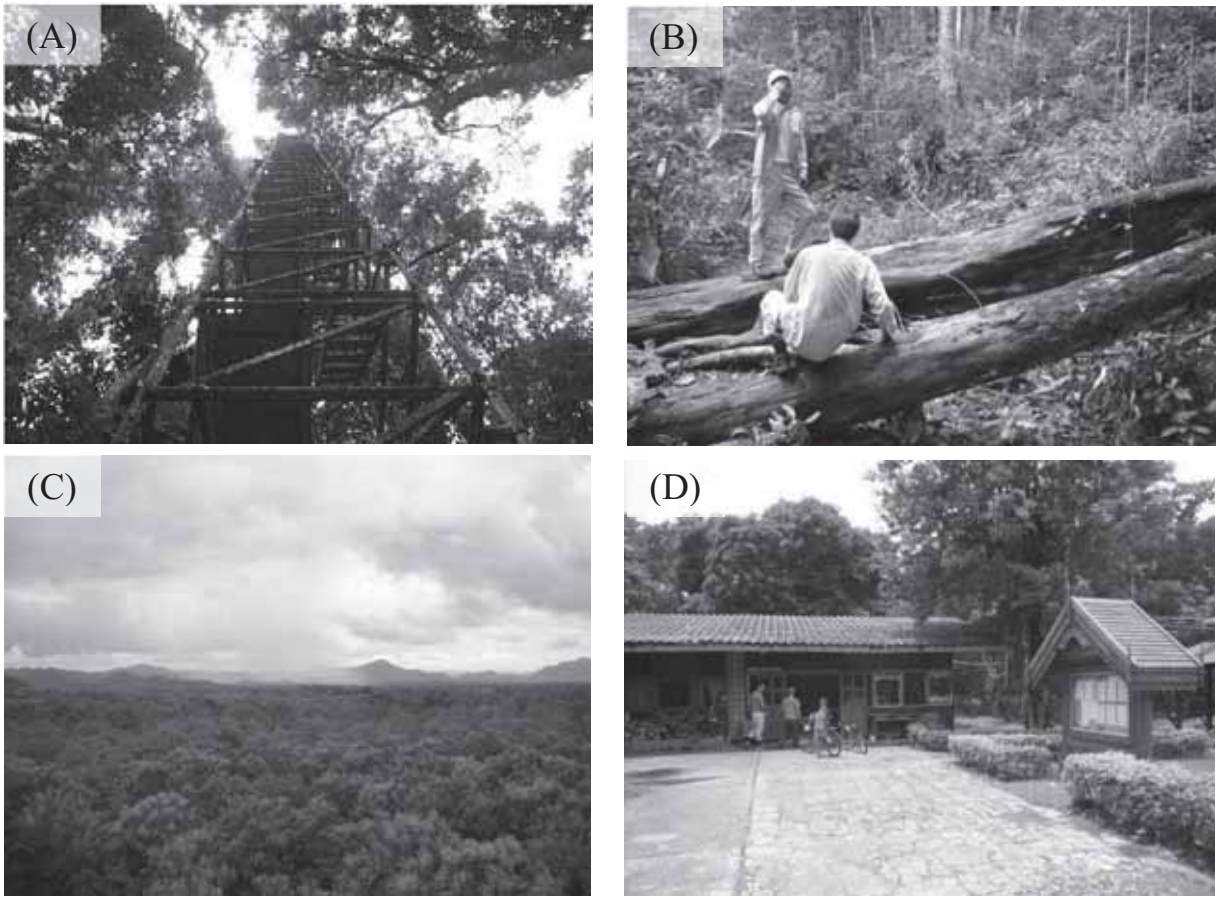

Fig. 2. (A) A distorted tower in KogMa; (B) Two fallen trees lied in a road; (C) MaeMo plantation; (D) FIO office in MaeMo

Chatchai. Indeed, in 2013 March, 35×50 m plot was thinned by FIO. The site has an area of 2000 ha, and the 55 m EC measurement tower was located in central part of the area.

I stayed in MaeMo for 9 days from August 9 to 18. There, 7 multi-disciplinary researches are conducted by Japanese researchers group. I describe only one keyword for each of them: EC measurement, soil respiration, sap flow, intercepted rainfall, leaf physiology, water potential of sap, and water-sprinkled tree physiology.

In MaeMo, first, I assisted maintenance of some EC method's instruments on the tower and learned the measurement system of that. Second, I assisted the measurement of soil respiration which had been conducted since 2000. During this internship, we measured 53 points soil respiration (Fig. 3. (A)) and the data will be used for evaluation of long-term trend and the influence of thinning. Third, on the night of 13th, we had a dinner with a chief and a sub chief of FIO MaeMo branch office. I interviewed them about their work for Japanese researchers and their feelings about that. As I described, when Japanese researchers ask a chief of FIO MaeMo branch office for some work, he orders his workers to do that if there is no problem to their timber production. They do not have hard feeling about that because they trust Dr. Chatchai. I felt there is a strong connection between Dr. Chatchai and FIO. And Japanese researchers have collaborated for 17 years. These two connections are at the core of this international research collaboration. Finally, I was present in the meeting about requests from Dr. Tanaka to local workers, Mr. Swang and Mr. Ei. Before that, Dr. Tanaka wrote up all requests from researchers to them in one page requests sheet. And he demonstrated how to do requested jobs according to the sheets (Fig. 3. (B)). Next day, he checked whether they can definitely do their jobs or not.

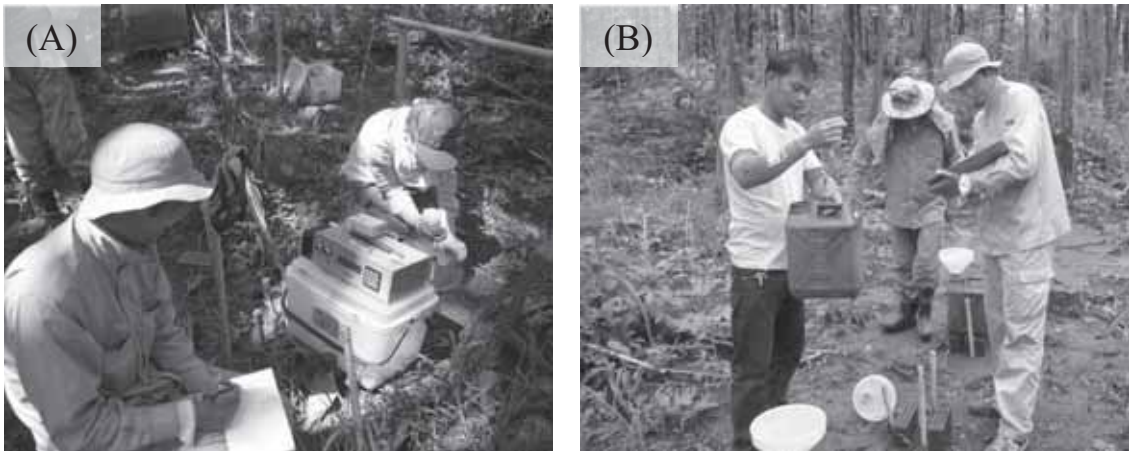

Fig. 3. (A) Measurement of soil respiration by Dr. Tanaka and me; (B) Demonstration of requested data collecting

2. Experience and achievements resulting from the internship

As a result of this internship experience I expanded my scientific and practical knowledge for research. It was particularly meaningful for me to have experienced following three management systems, (1) a domestic long-term observation management system in Kiryu, (2) an internationally collaborated management system in Thailand, and (3) a multi-disciplinary measurement system in Thailand. All of them are necessary for not only CO_2 and H_2O fluxes measurement using EC method but also any scientific research.

1) Kiryu site: Long term measurement management system

In Kiryu, a roster system is conducted by the students for long term observations to collect data such as meteorological and hydorological data. On the other hand, some progressive approaches are introduced in the site such as CH_4 flux and profile monitoring using TDLS (Tunable Diode Laser Spectroscopy). Hence, I think it is important for a long term observation project not only to keep regular measurements, but also to add new observations that answers the new needs, for leading to significant results.

2) KogMa and MaeMo site: internationally collaborated multi-disciplinary measurement system

As a matter of course, we cannot go to a foreign research site very often. So it is essential to conduct successful research in foreign site with help by local workers. I realized that when Dr. Tanaka ask something to local workers, he thinks about workers' feelings. In fact, he changed the measurement method of daily rainfall data to make local workers' work load lighter. Before that, they measured the quantity of stored rainfall by commonly used graduated cylinder. However, he changed from cylinder to spring balance, which get workers to measure it easier and faster. By doing that, he upkeeps the relationship with them, improves their motivation and make it easy for them to continue their works.

Commencing with Dr. Chatchai, there are many collaborators including local workers in Thailand. However, it is a problem that there is no local student researching in KogMa or MaeMO with Japanese.

Dr. Chatchai said Thai students tend to want studying typical advanced technologies like remote sensing. And they do not want to feel like doing field research. I think environmental education in Thailand is not enough. When I was a first year student of TUAT, I didn't feel like walking in forest for my research. However, through the classes, I learned that the tropical rain

forests contribute major latent energy sources, changes and reduction of tropical forest affect carbon and water balance in tropical and adjacent regions. And I feel the necessity and importance of field researches for improving the CO_2 absorption ability of forests.

Therefore, I suppose the lectures or field observation classes that help students to arrive at the awareness of the field work's importance for solving immediate global environmental problem such as climate change and deforestation should be taken place in Thailand too.

3. Relationship between the internship experience and future career development as a field-oriented leader in Asia and Africa

I gained valuable knowledge, skills and experience that will help me to become a leader in the environmental sector. In particular, Thailand study sites are managed by both local counterparts (Kasetsart Univ.) and Japanese groups (Kyoto, Kyushu, Nagoya, and Tokyo Univ.). Each of the groups is working on different topics including eddy covariance systems. Therefore, not only international collaboration but also multi-disciplinary corroboration is important. Indeed, when eddy covariance is examined, the other data sets such as soil moisture, vegetation species types, and tree physiology are also important as ecosystem processes. Therefore, various monitoring topics should be arranged and organized by the research group under multidisciplinary collaboration.

Secondary, continuous monitoring of flux is important. However, continuous monitoring is typically difficult because of the limitation of financial support and labors. Therefore, it is crucial to know how the monitoring effort is technically continued. Such experiences can be useful when I will be involved in forest environmental issues with local people.

Lastly, I would like to thank my hosts, Dr. Kosugi, Dr. Tanaka and all of the researchers I worked with in tree sites. I would also like to thank FOLENS and Professor Takashi Gomi for enabling me to participate in this internship, which was a very valuable experience for me.

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

The approach and attitude toward environmental issues in Fiji

Chie WATAI
Department of Agriculture
Tokyo University of Agriculture and Technology
Host Organization: OISCA
Location: Fiji
Duration: Sep. 9, 2013 – Oct. 2, 2013

Key words: organic agriculture, environmental conservation, environmental education

1. Introduction

OISCA, where I worked on an internship, is an NGO and the name of 'OISCA' means Organization for Industrial, Spiritual and Cultural Advancement. The main aim of OISCA is to cultivate human resources and nations through agriculture by development of farming villages, environmental conservation and educational activities. Since OISCA has established in Japan in 1961, its activity areas broaden all over the world and now it is located in more than 30 countries and areas in the world.

There is an activity area of OISCA in Fiji and I did my internship for about 3 weeks there. OISCA in Fiji starts from 1990 cooperating with Ministry of Youth and Sports in Fiji. They are working together mainly based at National Youth Training Center for youths and school dropouts. In fact, there is a social problem that youths and school dropouts in Fiji are hard to take a stable job. To solve this unemployment problem and consequently to cultivate human resources and to increase awareness of habitants, OISCA in Fiji starts the following activities.

a) Organic agriculture training
b) Children's forest program (CFP)
c) Mangrove plantation
d) Coral leaf restoration

OISCA has been doing such activities in the world but these are localized to adjust to Fiji. In this training center, the Fijian staff who studied agriculture or marine environment conservation in Japan teach the trainees to introduce Japanese technique of agriculture or marine environment conservation into Fiji. As

there is a characteristics in Fiji, so called 'Fiji time,' that many Fijian are easygoing and careless about time, OISCA emphasizes the discipline to introduce the Japanese time management about agriculture. Of course, the aim of these activities is not only technical training for Fijian but also environmental conservation in Fiji. There are a lot of problems in Fiji such as destruction of nature by development of recreational facilities, unstable supply of food, waste problem, and so on. OISCA in Fiji deals with these problems through the activities to make a sustainable environment.

During the internship, I have experienced a part of the management task of OISCA and the correspondence to visitors as an OISCA staff in addition to the above-mentioned activities. The goal of this internship is mainly learning the approach and attitude toward environmental issues in Fiji and secondly thinking globally through the international communication.

2. The activities of this internship

2-1. Organic agriculture

The training center has the fields and the cotes. Organic agriculture has some sections, organic farm, poultry section and piggery farm. The trainees are growing them every day. For environmental conservation, they make the harmless pesticide with organic products not to use the agricultural chemicals and they reuse organic products for the compost. I will introduce mainly organic culture.

In organic farm, we grew many kinds of vegetables, such as tomatoes, beans, lettuce, capsicum and so on. The trainees were teaching me how to grow them and the reason why we do so. It was a big different way to grow them from that of Japan because climate, soil and equipment were different. As there are few machineries in Fiji, Fijians usually use cows and horses to cultivate or to harrow. It was almost for the first time to do agriculture activity, so I was always studying and I felt it very interesting. For example, I was impressed by lettuce. Figure 1 shows the seeds of lettuce. I was very surprised at their smallness because I had never seen them. And another example was the way to grow tomatoes. In contrast to plastic greenhouse culture in Japan, they grow tomatoes outside in the training center, so they have changed how to grow tomatoes; they make the stands against the wind. As I explained, organic agriculture in the training center was very interesting and challenging because I can study and get something every day. I guess that it is difficult in Japan to experience the activities such as growing the vegetables only by hand work, cultivating with cows and horses, doing agriculture without chemicals, making the compost and so on. I was very happy to experience these activities.

(Figure 1. very small seeds of lettuce)

2-2. Children's forest program (CFP)

OISCA is implementing Children's forest program (CFP) all over the world. The objective of this program is for children to get interested in environmental activities naturally through the plantation or environmental education in school. They grow the trees for plantation of CFP near the training center (Figure 2 shows). This way to grow the trees is similar to that of vegetables in the center, for example, using the compost or growing only by hand work. To tell the truth, I have little time to do the CFP activities, so I could not attend the principal activities of CFP. I wished I had had more time at that time.

(Figure 2. The nursery for CFP near the training center)

2-3. Mangrove plantation

One of the activities, mangrove plantation, is not only for the trainees or children but also for habitants in Fiji. The purpose of mangrove plantation is to make the environment better, to increase the awareness about environment and to build the communities through the plantation because mangrove plantation needs the cooperation of a lot of people. Especially, mangrove plantation and coral leaf restoration have an important relationship as environmental activity because mangroves make a comfortable space for marine organisms such a coral leaf. Mangroves along the coast prevent the soil erosion from the rivers and the roots of mangroves are good living space for marine organisms.

Mangrove plantation has two steps.

1) growing the nursery trees apart from coastal areas
2) transplanting the grown-up nursery trees to the coastal areas

As the nursery trees are weak against the waves of the coastal areas, mangrove plantation needs two steps. Although few mangroves can survive after transplanting because of waves, I am sure that the nursery trees grown-up steadily make environment better. Figure 3 shows the mangrove plantation. Mangrove plantation is tough but it was fun and I was looking forward to seeing the growth of mangroves as soon as possible.

(Figure 3. Mangrove plantation with habitants in the village)

2-4. Coral leaf restoration

Recently, coral leaf was destroyed because of global warming, exploitation of coral for industry, coral bleaching and soil erosion. As I mentioned before, coral leaf restoration and mangrove plantation have an important relationship. The object of this activity, coral leaf restoration, is to increase the coral leaf by plantation and monitoring, to make the ocean environment beautiful and to activate the marine organisms. I got only an opportunity to monitor the coral leaf because I had no time to plant coral leaf. I was very regretted about that. When I observe the coral leaf through the monitoring activity, I found many fish near the coral leaf (Figure 4 shows). Coral leaf made the living space for marine organisms in fact and I was moved by the situation. Some villages in Fiji that had cooperated with OISCA take the action of marine conservation for saving marine environment and increasing fish. I hope that this activity expands more and that I can help for it.

(Figure 4. Many fish near the coral leaf)

3. Conclusion

Through this internship, I found the importance in the activities.

a) Organic linkage among the activities

b) human combination for the activities

c) continuity of the activities

Forest, mangrove, coral leaf and agriculture link each other and lead abundance of food or environmental conservation. In these activities, all the members cooperated. As they have their roles and cooperate with a lot of organization, they have big individual responsibilities. I felt that we cannot work alone. Many Fijian practice the custom of mutual cooperation and they helped me kindly. And I think that all kinds of support are needed. International cooperation needs not only material support but also technique, cooperation of labor, emotional support and so on.

I think that what I can do for international cooperation is to tell my experience or problems in Fiji and to look for and take the opportunities about international cooperation. The experience of this internship is a driving power for me.

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Environmental education and capacity building

POYA Ghulam Hussain
Environment Conservation
Graduate School of Agriculture
Host Organization: Wildlife Conservation Society
Location: Band-e-Amir National Park, Bamiyan, Afghanistan
Duration: 2013-August 9th – September 12th

Key words: Wildlife Conservation Society, environmental issues, environmental education, capacity building, alternative livelihood source

1. Wildlife Conservation Society (WCS)

Wildlife Conservation Society is an American NGO founded in 1895, with the mission to save the wildlife around the world. WCS has started its mission in Band-e-Amir National Park, Bamiyan, Afghanistan in 2006 focusing on biodiversity conservation, rangeland improvement, supporting the local governance institution through capacity building and improving sustainable livelihood of the local community.

The ongoing activities toward the objectives are summarized below.

1. Technical capacity development through environmental education program for the schools around the park, community conservation education outreach and expanding partner's capacity.
2. Facilitate community livelihood development by securing sustainable sources of direct benefits to local communities (Community Livelihood Development-CLD). This objective contains the activities like community ranger program (camera installation, training and capacity building, salary for new employed rangers), ecotourism (English language training for rangers, shop owners and tourism guider, planting in amenity zone and installing signage in the park area) , and fuel efficient stove project(distribution of stoves and lanterns to the local community)
3. Create and strengthen community institution through providing training for the members of Band-e-Amir Protected Area Committee (BAPAC), a collaborative management board and Band-e-Amir Community Association (BACA), developing a management plan with park warden and other related agencies.
4. Strengthening laws, policy and institution through studying and then drafting resource use rules and regulations.

2. My activities during the internship

My activities during the internship are basically divided into two types.

A. Office based activities
B. Field based activities

Office based activities: in office based activities I attended in a series of meetings like weekly meeting and monthly meeting along the NGOs' staff. In the meetings, I learned how to make weekly and monthly planning and reporting in an organization. Participating in workshops is another office based activity. The workshops are provided for the school teachers and newly employed rangers of the park, and I participated actively with the school teachers in environmental education training in teacher's workshop. We listened to the trainer lectures and presentations regarding the current environmental issues in Band-e-Amir National Park and highlighting roles of environmental education to reduce these issues. In the workshop for the newly employed rangers we gained information regarding the responsibility of a ranger in a national park.

Workshop for the newly employed cleaner of the Band-e-Amir National Park

Workshop for the school teachers, WCS office Band-e-Amir National Park

Field-based activities: in field based activities I joined WCS team in environmental education monitoring activities of the two schools within the park area. The team has established four types of committee in the frame of environmental education program. The committees are listed below:

a) Fuel committee
b) Livestock committee
c) Events registration committee
d) Environment committee

These committees included teachers as a supervisor and students from grade 6^{th} to 12^{th} as members. Students in these committees collected data and information filling in a certain format, from their respective villages, then submit them to their supervisors. The supervisors submit them to the WCS for analysis and reporting on a monthly basis. I with the staff from WCS went to monitor the activities of the mentioned committees in two schools in Sharistan and Kopruk villages within the national park.

Initiating and participating in cleaning campaign is another field based activity in this internship. After ending of the workshop for the newly employed cleaners of the park in the park office, we toke the cleaning stuff from park office and collected garbage (plastic bottles, other plastics, cans, and clothes…) from the lakeshores where the visitors boating point and the main shrine of the park are located. We asked visitors to join us in a demonstration encouraging volunteer activities.

Generating data to know the local people perception and attitudes regarding the national park and its

management was another type of field based activity. I interviewed 80 households from six villages within the park to know their knowledge and perception regarding the protected area and its management. I found that the land tenure, alternative livelihood source, uneven distribution of tourism revenue is the main issues impacting the sustainable management of the Band-e-Amir National Park.

A cleaning campaign activity around lakeshore, Band-e-Amir National Park

Interviewing people in the field, Band-e-Amir National Park

3. Background of the WCS activities toward environmental issues in Band-e-Amir National Park

Decreasing the dependency on the natural resources for the source of livelihood

People are highly dependent on the natural resources as a source of livelihood in Band-e-Amir National Park. They engage in livestock and dry land farming which is called " Lalmi" in the local language, overgrazing and bush collecting as forage and for heating, and also uprooting of the bushes to transport them out of the national park for sale in a local district bazaar as fuel to make money, hunting of birds and improper fishing methods. Consequently, biodiversity loss, flooding and soil erosion became a critical environmental issue within the national park. WCS was started its activity addressing biodiversity conservation and supporting sustainable livelihood sources. Improving alternative livelihood source through implementing some projects, distribution of stoves and lanterns to the households within the park to decrease bush collection and uprooting as fuel and training for the local initiatives for developing tourism are the examples of activities aiming at sustainable livelihood improvement and biodiversity conservation.

Environmental Education:

Environmental education is another program that WCS started to enhance the awareness and knowledge of local people as well as to elevate the understanding of new generation about the context of their surroundings and the importance of biodiversity conservation through teaching formally at their respective schools within the Band-e-Amir National Park. I was in a three-day workshop with the school teachers and asked them whether the impact of environmental education is being tangible or not. Most of them said yes however, they believed environmental education impacts, might not be tangible in a short time in Band-e-Amir National Park.. Related to the topic, I personally asked some ordinary people during my interview regarding the importance of vegetation cover, wildlife and so on. They answered that they are happy, because vegetation cover was improved, flooding decreased, and they can see a lot of fishes in lakes since they stopped improper fishing, there are a lot of birds and wild animals since hunting is banned, and these sources are valuable and they did not know the importance of environment components before the outreach environmental education by WCS.

Governance and institution development:

Another important objective for WCS was on the improvement of governance. WCS with other related actors like Department of Agriculture Irrigation and Livestock, Afghanistan Environmental Protection Agency (NEPA), technically and economically supported the establishment and strengthening of the collaborative institution like Band-e-Amir Protected Area Committee (BAPAC), park office, and Band-e-Amir Community Association (BACA). To be mentioned that the government related agency was the only actor dealing with park management in the past so the local people opinion had not been taken into account at all. The collaborative approach of the Band-e-Amir National Park was started in 2007 and all stakeholder groups including the local community were involved in decision making and enforcement. Currently the collaborative board (BAPAC) is struggling with various issues such as capacity building and so on however, the establishment of this committee (BAPAC) has improved the management condition of the Band-e-Amir National Park in general. Addressing the issues in BAPAC committee, WCS works closely with all members in BAPAC to enhance their capacity in terms of management decision and enforcement. WCS believes that if there is good governance in place then environmental issues will be decreased accordingly. WCS provides workshops, training and exposure visits for the park staff, rangers, community representatives and community association to build their capacity in environmental management and conservation. I met a representative from local community who along with his colleagues visited a national park in Thailand. He said that the trip was organized by WCS and it was really effective to learn about local resident's roles in park management.

But the problem of alternative efficient livelihood still exists, and it is directly impacting the well status of Band-e-Amir ecosystem. People still rely on bush collection for heating and livestock feeding as well as dry land farming which are disturbing the natural function of the ecosystem. The tourism is getting increased producing a lot of garbage without care of its harmful environmental impact. The visitors seem to have low knowledge of garbage management and come from remote areas. Moreover there is not a good system of garbage collection and treatment within the park and it creates a high risk of water pollution in travertine lakes in near future.

Risk of water pollution because of garbage by visitors near the lakeshores in Band-e-Amir National Park

4. My own idea and future vision

I think the occurrence of environmental issues depend on various factors in the context of different countries. Such factors include not only industry and economy development but also poverty, war and institution deficiency and high dependency on the natural resource for the livelihood. I think it is a challenging task for the policy makers and managers in environmental management, to conserve vulnerable ecosystem while providing the basic necessities of its inhabitant in the context of high dependency on the ecosystem resources and services. I think in the context of Afghanistan for improving the protected area management we need to improve the protected area productivity through various possible industries like tourism and so on for such a purpose we need to support the local initiatives and enterprises. Supporting local initiative needs skills, knowledge and experiences. During this internship, I spent most of the time in the field communicating with different entities such as local community, government organization and NGOs so I have mad quit a good network and I think making a network is really important for an environmental leader to share the environmental issues and seek a comprehensive solution. I think at this internship, I have gained some of the experiences and skills such as social skill, field experiences and so on. And all what I gain in this internship will stand me to act as a good environmental leader in the future.

In the future I would like to continue researching, focusing on the roles of environmental education, as a factor decreasing environmental issues as well as the roles of tourism industry development as a potential source of alternative livelihood for the local community in a protected area. What I learned during one month internship with WCS is highly supportive approaching my goals in the future.

I would like to thank WCS's staff dedicating their times and energy supporting me completing this internship. I would like to thank FOLENS for providing such opportunity, to get valuable skills and knowledge during my internship with Wildlife Conservation Society as an intern in Band-e-Amir National Park in Afghanistan.

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Internship with the Cornell Soil Health Center, Cornell University On Soil Health and Management Approaches

Name: Omari Richard Ansong
Department: Department of International Environmental and Agricultural Science (IEAS)
Name of Graduate School: Graduate School of Agriculture
Location: Cornell Soil Health Center-Cornell University. New York
Duration: 8 weeks

Key words: Soil, Soil health, Soil management, Soil testing parameters, Sustainability

Description of the host institution

Cornell Soil health center is an appendage of the Department of Soil and Crop Sciences of the Cornell University. The center is primarily made up of academic staff, researchers, extension educators, laboratory technicians as well as administrative staffs of the department. The center is headed by a senior lecturer of the Soil science department. The extension educators serve as the main channel whereby scientific information is delivered to the various stakeholders who are usually commercial farmers. The following organizations; New York Farm Viability Institute, New York State IPM Program, Northeastern Sustainable Agriculture Research and Education and the Northern New York Agriculture Development Program currently support the center.

The main goals of the center include identifying and developing solutions to the critical soil quality problems currently reducing farm sustainability and profitability for growers in New York State and the Northeast region. The center is also committed in working with growers to incorporate new practices for the benefit of their soils and to ultimately improve farm and environmental sustainability. Again, some of their activities are aimed at developing the tools and infrastructure to provide meaningful soil quality assessment and management suggestions to complement existing soil testing services in a cost-effective manner. Finally they aim at increasing soil health literacy among growers and agricultural support professionals.

Fig1. Extension and outreach program by Cornell soil health researchers with farmers.

The center is currently involved in the following activities; diagnosing the health status of soils from various farms and different locations using a set of established protocols at a fee-for-service basis since 2007, organizing seminars, workshops, field days on critical Soil health issues for farmers, training various stakeholders affiliated to Soils from various parts of the world, conducting research on sensitive and critical issues on agricultural sustainability.

Activities undertaken during the internship

The center has a number of assessment protocols that are usually used as an indicator in determining the health status of agricultural and cultivated soils. They are field sensitive management, agronomically meaningful, quantitative, inexpensive and standardized tests which are exclusive to the center. The methods have been proven to be very effective in reaching the local audiences of each state as well as facilitating networking between university, cooperative extension, and other agricultural service providers within the Northeastern part of New York state.

During my 8-week stay with the Cornell soil health center, I spent some of my time undergoing training on the established assessment protocols of the center. These protocols were necessary as far as my quest of enhancing my knowledge on Soil management approaches were concerned. Also I factored the possibility of incorporating the skills and strategies to be learnt into my future studies as well as in my future career.

Fig.2 Some Laboratory testing procedures used at the Cornell soil health laboratory.

I also participated actively in field experiments being undertaken by the center. The center was conducting a number of field experiments such as nitrogen use efficiency in corn production, effects of intensive plowing regimes on the biological, physical and chemical properties of soils. I had the opportunity acquaint myself with some skills required in carrying out such kind of field experiments.

The center also organized weekly seminars fully participated by its members. Some members gave presentations on their study areas or a related soil health management issue. It was an interactive and productive learning activity for me since I learned a lot especially on issues about soil management.

Background of the targeted environmental issue

My targeted environmental issue with regards to the internship was sound management of soils for human sustenance. With the ever increasing world human population raising the need to boost agricultural production, intensification of agriculture seems to be the closest call for mankind. Intensive crop production has often resulted in soil degradation contributing to reduced crop yield, increased production inputs and lower farm profitability.

Soil is at the center of human existence and key in supporting almost all the activities of man. For this reason, it requires much more attention and care than being given now since the more we know our soils, the better we can care for it. Farming activity for instance is not a natural process (Bowman 1994), since it disrupts the soil in many ways. For example, mono cropping and continuous tillage decrease diversity of life forms, destroys soil structure, promotes loss of organic matter and finally disrupts nutrient cycling. These practices in addition to other factors cripple the soil's ability to respond to stress and leave it unable to function the way it should.

Generally in terms of agricultural production, people`s opinions and understanding on soil management with the aim of sustaining it is usually narrow. This is exhibited usually in the type of soil management regimes

adopted in their farms. As a result, agricultural lands have been often abused through intensive cultivation in the form of heavy plowing, indiscriminate burning, poor fertilization, etc. These negative practices have resulted in problems such as soil erosion, soil compaction, leaching, poor drainage, low organic matter levels, reduced fertility of soils, reduced biological activity etc. With these problems on the rise, human sustenance is not assured. It is however not surprising that some locations on the globe notably the Sub Saharan Africa are already experiencing massive civil strife and food insecurity challenges.

Adopting healthy soil management techniques have long been suggested by the academia, experts and researchers as one of the strategies to curb the above threats to the soil. They range from use of organic plant and substrates or residues, minimizing plowing regimes, cover cropping, manuring, crop rotations etc. while ensuring a steady growth in agricultural productivity. As seen above, some of the approaches suggested are less expensive, practical and known to ensure a long lasting sustainability of the soil once implemented.

However, there seems to be a massive ignorance and resistance to change attitude on the part of farmers and other stakeholders due to their limited understanding on soils suggesting the need to re-strengthen the education on such targeted people through various means such as seminars, workshops, field demonstration, field days, mass media education etc.

My thoughts about environmental leaderships and future vision

Strengthening the younger generations on leadership roles with regards to issues about the environment is indispensable. Such a move and awareness creation is useful as far as the future of posterity is concerned. My thoughts about environmental sustenance and leadership are grouped into short and long terms. In the short term, I still see myself in the learning process about the critical issues of the globe and while in the long term, I will have to play a role in protecting the globe through research, extension and educational activities especially in my region. Referring to the massive improvement in my view of soil health management approaches now, I hope to sell to my colleagues the idea of setting a similar organization in Ghana by enhancing soil literacy and awareness creation among farmers in my region similar in perspective to that of Cornell Soil health. With that in mind, farmers and other stakeholders with limited knowledge about soil management issues can benefit tremendously while aiding to protect our resources. Again, I am planning to undertake a research work hopefully in Ghana by adopting into my study some of the Soil health assessment protocols learned during my internship experience.

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

The internship in International Crop Research institute for the Semi-Arid Tropics (ICRISAT)

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[2)] Host Organization: International Crop Research institute for the Semi-Arid Tropics (ICRISAT)

Location: Patancheru, India

Duration: 2013.11.26 – 2013.12.07

Key words: Sorghum production, Biological Nitrification Inhibition (BNI), nitrate leaching, CGIAR, "Science with a Human Face" mission, leadership

1. The visions and goals of ICRISAT

The International Crop Research Institute for the Semi-Arid Tropics (ICRISAT) is the only one research institute in the world, serving dryland regions. ICRISAT is a member of the CGIAR Consortium, a global agricultural research partnership for a food secure future. The semi-arid tropics cover 55 countries in Asia and sub-Sahara Africa, which has 2 billion people, including 664 million people who are facing low economic condition. Semi-arid tropical regions are mostly vulnerable to climate change with very little rainfall, degraded soils and underprivileged social infrastructure. The vision of ICRISAT is prospering, food-securing and resilient tropical dryland areas by reducing poverty, lack of food, malnutrition and environmental degradation. Due to the visions, ICRISAT conducts research on five highly nutritious and drought tolerant crops, such as chickpea, pigeon pea, pearl millet, sorghum, and groundnut and the management practices.

Fig.1. Main gate of ICRISAT

Headquarters of ICRISAT is located in Patancheru, India, whereas, regional hubs are positioned in Nairobi, Kenya and Bamako, Mali. ICRISAT also has five country offices in sub-Saharan Africa. There are 1,350 ha of total experimental fields in headquarters office. The research division is divided into 1) Resillient Dryland System, 2) Markets, Institutions, and Policies, 3) Grain Legumes, and 4) Dryland Cereals divisions.

Resilient Dryland System Division focuses on reducing vulnerability to drought and climate change by increasing crop diversity and value. Division of Markets, Institutions, and Policies pursues to develop inclusive prosperity of social science approach. The objective of Grain Legumes Division is to raise and secure legumes productivity in term to human health, financial income, and environmental sustainability. In addition, increasing productivity of grain crops is the objective of Dryland Cereals Division to end the universal food problems, lack of food.

The outcomes expected are 1) food sufficiency, 2) intensification, 3) diversification, 4) resilience, 5) health and nutrition, and 6) women empowerment. ICRISAT strongly focuses on its mission that "Science with a Human Face", inferring that research is not for institution, but it is dedicated to the economically unprivileged societies. The strategy is to apply science and technology for food development and security, poverty reduction, environmental protection, livelihood improvement of small-holder farmers in dryland tropical regions.

2. The backgrounds of BNI project

The project of Biological Nitrification Inhibition (BNI) is a five-year cooperative research project between Japan International Research Center for Agricultural Sciences (JIRCAS) and ICRISAT. The project was established in October 2009, in which, the term of this internship was in the transition period from the fourth to the fifth year of the project. The aims of BNI project are 1) to clarify the most efficient field conditions for BNI potentials of sorghum, 2) to investigate BNI activities in soil condition, and 3) to apply BNI in the field in order to obtain new fertilization guideline and recommend effective crop rotation system of sorghum.

Sorghum plants, both grain and sweet sorghum, is one of the main grain crops in semi-arid tropical regions. Sorghum has been known as crops which needs abundant amount of nitrogen fertilizer. However, the price of nitrogen fertilizer is rising over recent years, causing another financial problem for farmers. Furthermore, the existence of nitrogen fertilizer in soil possibly causes environmental pollution through nitrate leaching, nitrous oxide emission, and nitrogen volatilization. Cost of nitrogen fertilizer loss from the field without being used by crops is estimated recently with equivalent to approximately 17 billion dollars per year worldwide. Nitrification is one of N-cycle pathways in the soil involving microbiological activity. Principally in nitrification, immobile $NH4^+$ is converted into highly mobile $NO3^-$ which is potentially lost via nitrate (NO3) leaching, and gaseous N emissions (N2O, NO and N2) by denitrification. In this case, controlling nitrifier activity to improve nitrogen use efficiency (NUE) of agricultural production systems is important.

Fig.2. Sorghum field in ICRISAT

Fig.3. Chickpea, one of popular legumes in semi-arid tropics

Plant roots can release nitrification inhibitors for suppressing soil nitrification. The inhibitors have been termed as biological nitrification inhibition (BNI). ICRISAT has found that sorghum has ability producing BNI. Until today, three kinds of nitrification inhibitors, MHPP (methyl 3-(4-hydroxyphenyl) propionate), sakuranetin (5,4'-dihydroxy-7-methoxyflavanone) and sorgoleone (2-hydroxy-5-methoxy-3-[(8'Z,11'Z)-8',11',14'-pentadecatriene]-p-benzoquinone) have been isolated from sorghum roots cultured hydroponically through this experiment. Releasing of nitrification inhibitor by sorghum roots requires presence of $NH4^+$. Additionally, soil pH contributes as limiting factor of BNI (for example, nearly 80% of hydrophilic-BNI released was suppressed at pH $\geq$7.0).

BNI has succeeded to be applied in hydroponic cultivation system. The results can be useful fundamental knowledge towards utilization research of BNI in sorghum. Application of BNI in field based on soil cultivation with extra complex condition is potentially studied and improved in the future.

3. Experiences in internship

Internship was done in the headquarter office of ICRISAT in Patancheru, India. It was held on weekdays from 8.00 a.m. to 5.30 p.m. for 10 days, from 27 November to 6 December. Internship activity was conducted mainly in Soil Biochemistry Laboratory of Resilient Dryland System Division. The host researcher was Dr. Takeshi Watanabe, a special project scientist expert on soil science. There are three scientific staff in the laboratory, managing and conducting the research. Three field managers who have responsibility in experimental field also work in the same laboratory. More than ten workers are hired to support field management and experimental preparations. In addition, there was a Japanese post-doctoral fellow, Dr. Tomohiro Kurai who is specialized in plant physiology. I followed mainly two tasks during the internship program. The first task was joining the annual meeting of the BNI project and a discussion session between the researchers of JIRCAS and ICRISAT. The second task was supporting parts of the BNI project by taking soil sampling and analyzing nitrate and ammonium content of soil. In addition, I followed the scientific staff to guide and manage field management of sorghum cultivation field.

The annual meeting of the BNI project was held by ICRISAT on November 28 and 29. Twenty researchers attended the meeting, including host researchers, researchers from related projects, Japanese staff of Agriculture Ministry, and researchers of JIRCAS. The BNI project has been conducted for four years since October 2009. This year will be the last year of the project. The present aim of this project is to identify BNI from sorghum plants in field and evaluate its effectiveness of the application in soil cultivation system in field. In order to evaluate the effectiveness, new fertilizer guideline for treated sorghum plants by BNI is conducted. The tasks are divided for each researcher, for instance Dr. T. Watanabe conducts BNI measurement through soil chemical analysis, such as soil nitrate and soil ammonium dynamics. Moreover, Dr. T. Kurai observes soil micro-organisms' activities which contribute to releasing of nitrification inhibition substances by sorghum roots. This project has succeeded in detecting and evaluating existence of BNI from sorghum roots in controlled environmental cultivation system, such as hydroponics. Nevertheless, the similar procedure in soil cultivation medium has not resulted in great outcomes as expected yet. It is related to soil micro-organisms' activities which possibly consume BNI, causing losses of BNI in large amount. According

to this disadvantage, Dr. Kurai measures population of nitrification inhibitor substances from hydroponics, ammonia-oxydizing archea (AOA) and ammonia-oxydizing bacteria (AOB), using real-time PCR method, however, those substances were not detected in the soil. Further, the experimental soil type is Alfisols, having lower nitrification rate, makes it more difficult to determine whether nitrification inhibition is caused by BNI substance from sorghum root or originated from soil characteristics of Alfisols. These experimental problems of should be solved in the future.

Discussion also focused on the effect of soil pH to nitrification inhibition ratio. In general, BNI activity can be activated under low pH soil. At the same time, nitrification pathway itself is also inhibited in low pH condition. These complicated factors in the soil made it difficult to solely understand the nitrification inhibition of sorghum as the effect of BNI. Based on field experiments, the project team constructed a new fertilizer application guideline for sorghum plants. The new application amount of N fertilizer is 63 kg ha-1, equals to 30% less than the currently recommended amount. As subsequent steps, confirming BNI effect in soil and quantifying nitrate leaching reduction by BNI become matters for discussion. Nitrogen tracer technique can be used as a confirmation method.

For the latter part of my internship activities, we sampled soil from sorghum field on 0-100 cm of depth. Nitrate and ammonium content were measured in laboratory after general preparations. The experiment tasks were divided to workers and scientific staff. Soil sampling in sorghum field was done by workers. Nitrogen analysis in laboratory was conducted by scientific staff. In ICRISAT, each position has each job description which is performed appropriately. A host researcher decides experimental steps based on the meeting and discussion. In the experiment, a field manager has responsibility on supervising workers in field. Workers conduct field managements and preparations, and scientific staff analyze and measure experimental samples in detail in laboratory.

Fig.4. Soil sampling

Fig.5. Preparation of soil analysis

I also joined Dr. T. Watanabe in visiting activity to three farmer's field during the internship. Mainly farmers cultivate sorghum and maize as important grain crops. Additionally, most farmers cultivate legumes such as, chickpeas, pigeon peas and groundnuts. Legumes are major source of protein in India, which is related to the custom of Hindu religion of Hindis (Indian people) who usually do not consume meat. Through the visit, I learned traditional farming systems in India.

These are the mixed cropping system of sorghum and pigeon pea, and the crop rotation system between sorghum and chickpea or sorghum and groundnuts. Both mixed cropping and crop rotation systems show effective impacts on crop production and environmental condition. Nowadays, farmers recognize the effectiveness of traditional cropping systems, therefore it is highly recommended that they would continue such systems.

4. Future prospects and ideas for environmental leaders

First, I realized the importance of application of science in the field levels. The missions of ICRISAT as "Sciences with a human face" involve quite important messages for environmental leaders. Based on this mission, ICRISAT continues scientific research and technological development that are applicable to small-holder farmers' levels in semi-arid tropics. In this case, BNI projects succeeded in identifying BNI compounds in controlled environment of hydroponics. Based on the result, researchers are working to find ways to apply practical techniques and technology to farmer's levels. Two of the outcomes so far are constructing new fertilizer guidelines for sorghum production and suggesting new crop rotation systems which are effective for the BNI facilitation. It has been known for centuries that excellent research result can be gained excessively under the controlled environment, such as in a laboratory condition and hydroponics cultivation system. Nevertheless, complex condition in field (soil) makes it difficult to gain expected results. This also occurs in the BNI experimental project, in which BNI has been clarified under the controlled environmental condition, but not yet in ongoing field research. This fact implies that applicable techniques in field within complex factors to approach the goal should be discovered and developed subsequently.

Second, I also realized the importance of wide views and knowledge. Besides basic knowledge according to the specific research subject, one theme of environmental research usually covers abundant knowledge of different scientific matters. Toward the better solution of environmental issues worldwide, wide knowledge is definitely required. For example, the BNI activity could be easily affected by soil conditions (physical, chemical, and biological properties of soil), soil types (taxonomy of soil), regional climate (climate science), social agricultural system (social science), and so on. Since ICRISAT covers semi-arid tropical regions in the world, succeeded research will be adapted to the other semi-arid regions, including the BNI project. In general, semi-arid regions have moderate temperature, humidity, and low rainfall. Indeed, each area has each character with different types of soil, geology, local climate, etc.. Those external factors require different application methods for each area. Also wide perspectives and understandings of the environmental backgrounds in each region are needed by project leaders and the researchers.

Finally, this internship encouraged my motivation to work in the international agricultural research institute in the future. It has been known that in recent issues, global warming, extreme climatic condition, and environmental (soil, water and air, etc.) degradation affect agriculture worldwide. Various environmental changes require development and improvement of agricultural technique and science. Thus, there would be big challenges for the environmental leaders to obtain the solution globally in the future.

Fig.6. Staff of ICRISAT, Dr. Watanabe (left side) and Dr. Kurai (right side).

In the last part of report, I would like to express my appreciation to Dr. Takeshi Watanabe and members of BNI projects. I also would like to appreciate staff of the FOLENS program for its financial supports and assistances.

Report of Internship
FOLENS Program
Tokyo University of Agriculture and Technology

Study on water management and quality in paddy field at IRRI

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International and Environmental Agricultural Science
Tokyo University of agriculture and technology
Host Organization: International Rice Research Institute
Location: Philippines
Duration: One month

Key words: International institute, Azolla, Water quality

1. International Rice Research Institute

International Rice Research Institute (IRRI) is an international independent research and training organization with headquarters in Philippines and offices in sixteen countries. It is also the largest non-profit agricultural research center in Asia. Their mission is to reduce poverty and hunger, improve the health of rice farmers and consumers, and ensure environmental sustainability. As known for its contribution to Green Revolution, IRRI has worked on food shortage problems. Green Revolution refers to a series of research, development, and technology transfer initiatives, occurring between the 1940s and the late 1960s, that increased agriculture production worldwide, particularly in the developing countries. Specifically, they had worked on the development of high-yielding varieties of cereal grains, expansion of irrigation infrastructure, modernization of management techniques, distribution of hybridized seeds, synthetic fertilizers, and pesticides to farmers. Now they promote Golden Rice.

I had belonged to Crop and Environmental Science Division, which conducts researches related to climate change. Climate change is a serious issue for rice production, as farmers will not be able to grow rice under the different climate condition in the future. My laboratory in IRRI works on the field of soil science and Azolla bank. Azolla is a floating plant which has been used as green manure for paddy field in Asian countries including Japan since it contains high amount of nitrogen. There are more than five hundreds species and IRRI has played a role as the Azolla bank. They basically culture and keep the species, and offer them when they receive requests from other institutes.

Fig. 1 Laboratory members

Fig. 2 Azolla house

Fig. 3 Azolla

2. Activities during the internship

My boss set me to a task about Azolla culture. Presently, one technician has been in charge of it, however he does not really record the characteristics of each species of Azollas. Therefore, my experiment was to reveal the reactions of each Azolla species to water quality such as different pH and EC levels. By figuring out these relationships, the better culturing way of Azolla could be found. Moreover, the amount of time and labor which technicians have to make will be reduced. I had learned that it is one of the important factors when it comes to organizations, because they do not want to waste expense on employment cost. Efficiency is the key word.

Thus, I had experiments of Azolla and water quality relationships. I had been told to conduct this experiment by myself beforehand, so I created protocol for the experiment and executed it with the technician. At last I proposed a better culture equipment to my boss; I was able to bring some results to the laboratory. I succeed to record relationship between Azolla and water quality. This is very meaningful because technician has not done this. Once he quits job, there will be nothing about Azolla data. Moreover, I proposed concrete idea for the better culture system. This new system was created to save time of Azolla care. Basically, I proposed new container which can store about eighty species at the same time, which will reduce technician's labor.

I also attended their group meeting and IRRI weekly seminar. I was able to observe how people work in international organization. Although each of them has different nationality and background, they can cooperate well thanks to the solid contacts. For example, workers weekly evaluate themselves and give a short report at the meeting so that they can share how each project is going on. In addition, the efficiency of their working style is checked. I realized how important the feedback and information sharing are. Moreover, by self-evaluation, they can motivate themselves.

3. My thoughts and ideas about environmental leadership and future vision based on the internship experience

There are several points I have realized and learned by this internship. To begin with, I was surprised at how feudalistic organization system is. There are clear positions such as international researcher, national

researcher, technician Ⅰ, Ⅱ, Ⅲ, and contract workers. Jobs are divided into several steps, and every one of them focuses on only their own works. For instance, contract workers do not even take phone call, but technician can take it. To be honest, I was not so comfortable with this system at first, because we do not usually work in that way in Japan. Although there are positions, we are to respect older people even if they are subordinate. I cannot still made decision which way is better, but it is obviously important to get accustomed to this different type of system. According to Japanese stuff in IRRI who have abundant working experience in the field of international cooperation, Japanese tend to be described as bad at using his or her followers. They do not feel comfortable driving someone, and this is why it makes difficult for them to have a strong presence in the field when they work with foreigners. Although I, from Japanese perspective, do not think Japanese way is inappropriate, I always consider we should appeal more what we have done in our work to others. Moreover, it is necessary to make strong bond with co-workers as in Japan we often try to do, so that we can understand each other's hard work.

Next, attending some seminars held by IRRI made me think the importance to know what the problems are in the country or region. Subconsciously I had a focus on quality of food rather than quantity before I visited Philippines. Japan no longer has issues with the amount of food; people care more about quality and taste. I knew there are people who are starving in the other side of world, but I did not think it is also issue in Philippines. I guess this is the typical example that you will not perfectly understand the problems unless you actually visit there. Thus, I have learned that it is crucial to always try to study what the problems are in the field.

Third, meeting a lot of researchers and interns gave me an actual sense of an international worker. It was quite exciting to talk with many people who have various back ground and face a problem together to solve it. One of the best gains from this internship is that I was able to feel the atmosphere of an international institute. Basically they have different work styles based on their life style. Some work very hard even they kill their weekends, others work at coffee shop and take their private time. However the important thing is output. They usually make three or five years contracts with IRRI so they are evaluated on what they have done at the end, therefore they have to obtain good results. Moreover, not everybody stays at IRRI for a long period. They seek other job opportunities for their careers. In other words, working at an international organization is not very stable unlike working for Japanese private companies. On the flip side, people can get chance to experience by working for different institutes or companies, and make use of them to develop their career. Once you obtain solid skills, it does not seem to be difficult to find a new job. That is why almost everyone who are in IRRI as international researchers have PhD.

Finally, I have found out what to do for my future through this internship. I guess my command of English is good enough but it will be better to have the third fluent language such as French or Spanish. I was so happy about that people were surprised at my English skill, but at the same time I was sad about it because the reputation of Japanese English is lower than the world standard. I see many Japanese people speak English well in my generation, but it will not be applied to Japanese whole society.

Also, making connection with those who work for international institutes is genuinely important to get a job. However, the bigger an institute becomes, the less it can give an impact on the local scale. For example, FAO is struggling with making effective and large impact on local societies by their projects. I

heard this when I luckily attended their workshop while I was in Philippines. On the other hand, IRRI is able to do that since they are specifically working on local levels, which is their advantage. In that case, it will be essential to be able to communicate very well with local people.

Thus, I would say what I need to do for my future is to try to develop my third language skill, get more working experiences, and get to know people. The reason why I think working experience is the key is that international organizations tend to evaluate on experiences. Since I am not fascinated by proceeding PhD straight after getting master degree, I would like to get as much experiences as I can in private companies. I hope that I can be a field oriented leader in the future.

6-7. ポストフィールド報告会・ケーススタディワークショップ/ Post-Field Reporting Seminar/Case Study Workshop

『ポストフィールド報告会・ケーススタディワークショップ』は、FOLENSプログラムの主要カリキュラムである「海外フィールド実習」および「インターンシップ」の報告会および総合討論会です。

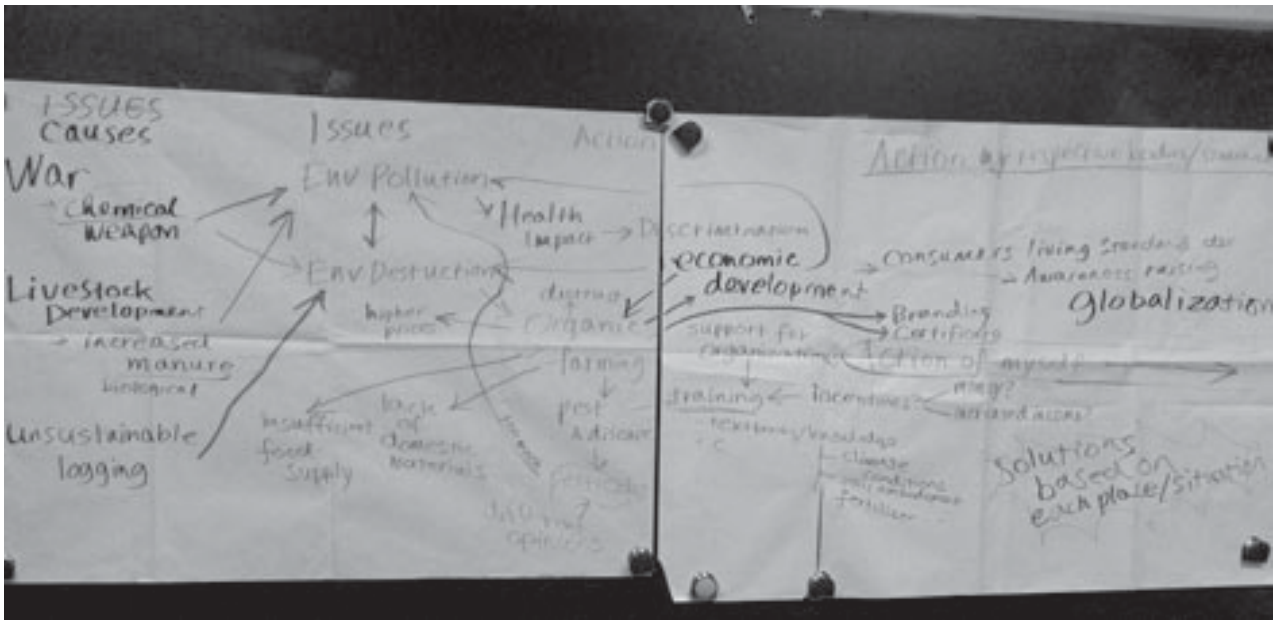
このセミナーは、単に個別の発表を並べて行うだけでなく、各々の状況の比較検討、専門分野との関連性の抽出、一見しただけでは直接の関係が見えにくい様々な事象の相互関与について考えながら、本プログラムが目指す「現場体験」と「俯瞰的視野」の双方を育成しようとするものです。毎回、発表への質問や議論が盛り上がるので、時間を要しました。ですので、1回あたりの発表は多くて６－７件、それらを繰り返し、開催回数はとくに後学期に４－５回に達します。このセミナーは、FOLENSにおける、隠れた、しかし非常に重要な行事です。

The Post-Field Reporting Seminar/Case Study Workshop is an event with a reporting seminar and a workshop related to Overseas Field Training and Internship programs, which are the main subjects of the FOLENS curriculum.

The seminar involves not only presentations but promotes cultivating field and bird's-eye perspectives, the aim of the FOLENS program, through comparisons of various circumstances, identification of the relevance of specialized fields, and investigation into the interrelationship among seemingly irrelevant events. The seminar tends to run longer than scheduled to accommodate many questions from participants and lively discussions. One seminar includes up to six or seven presentations, and several seminars are held throughout the year (four or five times in the second term). Although not widely publicized, this seminar is a very important event for the FOLENS program.

（尾崎宏和/Hirokazu Ozaki）

実習内容と学んだことの発表／Reporting presentation on the training and lessons



総合討論で作成した各問題の連関図／A linkage diagram of issues constructed in the overall discussion

6-8. FOLENS セミナー/ FOLENS Seminar

FOLENS プログラムでは、学生が多様な経験・研究分野・各国の状況にもとづく視点を持ち寄りながら、既存専攻や正規科目の枠組にとらわれない学際的・実践的な学び合いを主体的に進める場として、現場訪問やその事前後学習からなる月例セミナーを実施してきました。

活動の計画は、学生の希望をもとに、各特任教員の専門性にもとづく知見やネットワークを持ち寄り、学生と教員が議論を重ね策定されます。学生が計画、討論、対話、発表等に主体的に参画する機会が重視され、学生同士の交流活性化とともに、コミュニケーション能力の向上が目指されてきました。また、学内外の様々な背景を持つ人々との交流も促進されてきました。

学生からは「自身の研究活動の中では触れることのないテーマについて知る機会を得た」「研究者以外にも環境問題に対して活動する様々な方がいることを知った」「自国でも活用できそうな環境対策の具体的な方法を知った」「コミュニケーションの重要性を実感した」「他の専攻・国の学生との議論が新鮮」といった感想が寄せられ、FOLENSプログラムにおける現場立脚型・分野横断型教育を実現する重要な場となっています。

一方で、専攻での勉学や研究活動、さらに就職活動やアルバイトが忙しく、こうした付加的セミナーへの参加は難しいという声も多く聞かれました。FOLENSセミナーに限らず、分野横断型・現場型の教育と専門教育との両立・融合をどう支援し実現すべきか、今後も検討を続けるべき大きな課題であることが明らかとなっています。

FOLENS Seminar is a series of monthly seminars that offer students inter-disciplinary and field-oriented learning opportunities. Through field trips and pre- and post-trip workshops, students learn from each other, exchanging their views and opinions stemming from their different backgrounds, including their prior experiences, nationalities, and research fields. Their learning experience in FOLENS Seminar expands beyond the boundaries between different disciplines, and those between the university and society.

The activities are designed through discussions among the students and faculty, in which the interests of students and the professional advice from the faculty are shared. Students are encouraged to actively participate in a process of planning, discussion, dialogue, and presentation, to have a meaningful communication within and outside the university, and also to improve their communication skills.

Positive feedbacks from students such as the following show that FOLENS Seminar has been an important component of the program: “FOLENS Seminar has given me a chance to learn about topics that I would have never known if I had stayed within my specialty field”, “I got to know that not only researchers but also various other people work towards solving environmental issues”, “I have learnt some specific environmental solutions that I think I can apply in my own country”, “I have realized the importance of communication”, and “Communication with those from different disciplines and countries provided me with new insights”.

On the other hand, many students have also expressed difficulties in devoting their time and energy for such seminars while they are already busy with their degree studies, part-time jobs, and job hunting activities. The experiences from FOLENS Seminar have highlighted the great need for further discussion on how inter-disciplinary and field-oriented education should be integrated into university education and what supporting measures should be taken for such integration.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

FOLENS セミナー実施一覧/ List of FOLENS Seminar Activities

緑＝現場訪問（＝FOLENSを履修していない参加学生の数）/green = field visit (= the number of non-FOLENS students)

月 Mo	日 Date	タイトル Title	担当教員/ Staff in charge	場所/ Place	ゲスト講師/ Guest Lecturer	参加者 Attendants	
						学生 students	教員 Faculty
2010 年度/ Academic Year 2010							
June	9	第 1 回:FOLENS って何？／2010 年の活動計画 What is FOLENS? What should we do in FOLENS Seminars 2010?	二ノ宮 Ninomiya	府中 Fuchu		13	6
June	12-13	藤枝農山村実習:持続的な環境と経営を目指す有機無農薬小規模農業への挑戦 Fujieda Field Trip: Challenge of the organic, pesticide-free, small-scale farmers for the sustainable environment and livelihood	古市 Furuichi	静岡県藤枝 Fujieda, Shizuoka	人と農・自然をつなぐ会（杵塚農場） Kinezuka Farm	7	2
July	28	FM 多摩丘陵訪問〜「環境」「科学」「現場」の意味を考える Field Visit: Field Museaum Tamakyuryo – Working out What the "Environment," “Science,” and "Field" Mean to Us	二ノ宮 Ninomiya	FM 多摩丘陵/ FM Tama Hills	原宏教授（農学府） Prof. Hiroshi Hara (Faculty of Agriculture)	8	3
Aug	10	生物多様性とは？COP10 とは？ユース・リーダーの役割とは？ Preparatory Session: COP10/Convention on Biological Diversity	二ノ宮 Ninomiya	府中 Fuchu	松井宏宇　がけっぷちの生物多様性キャンペーン実行委員会代表／生物多様性条約市民ネットワーク運営委員／A SEED Japan／東京農工大学学生 犬塚千尋　がけっぷちの生物多様性キャンペーン実行委員会／A SEED Japan／津田塾大学学生今井麻希子 COP10 おりがみプロジェクトメンバー／生物多様性条	6 (4)	5

					約市民ネットワーク事務局 Hirotaka Matsui, Japan Civil Network for CBD/ NGO "A SEED Japan"/ TUAT student Makiko Imai, JCN-CBD		
Sept	30	生物多様性条約第 10 回締約国会議訪問事前ブリーフィング Preparatory Session: COP10/Convention on Biological Diversity	古市 Furuichi	府中 Fuchu		7	5
Oct	17-19	生物多様性条約第 10 回締約国会議（CBD-COP10；名古屋）への訪問 Field Trip: COP10/Convention on Biological Diversity, Nagoya	古市・二ノ宮 Furuichi Ninomiya	名古屋 Nagoya		11	5
Nov	19	COP10-CBD 訪問フォローアップ／12 月炭焼・里山ワークショップ プレビュー Follow-up Session: COP10/ Convention on Biological Diversity Preparatory Session: Charcoal and Satoyama for Sustainable Agriculture and Environment	古市・尾崎 Furuichi Ozaki	府中 Fuchu		16	5
Dec	6	持続可能な環境と農業のための炭と里山（第 2 回国際シンポジウム・エクスカーション） Field Visit: Charcoal and Satoyama for Sustainable Agriculture and Environment @ FM Tsukui	尾崎 Ozaki	FM 津久井/ FM Tsukui	及川洋征助教（農学府）・海外拠点教員 Assis.Prof. Oikawa (Faculty of Agriculture) and E&R Base professors	13	12 8（海外拠点教員 E&R Base）
Jan	26	炭焼・里山実習フォローアップ、廃棄物管理実習プレビュー Follow-up Session: Charcoal and Satoyama for Sustainable Agriculture and Environment Preparatory Session: Waste Management Issues and Technology	尾崎・谷口 Ozaki Taniguchi	小金井 Koganei		10	5
Feb	22-23	廃棄物問題：廃棄物処理施設・環境データ分析企業見学 Field Trip: Solid Waste Management— Visit to Waste Treatment Complex & Environmental Data Analysis Facility	谷口 Taniguchi	三重県 Mie Pref.		3	4
2011 年度/ Academic Year 2011							
Apr	28	FOLENS とは何か？2010 年度ふりかえりと 2011 年度活動計画 Reflection on FOLENS Seminar activities 2010/ Planning of FOLENS Seminar activities 2011	二ノ宮 Ninomiya	府中 Fuchu	-	16	4
May	18	3.11 とわたしたち Discussion: 3.11 and Us	二ノ宮 Ninomiya	府中 Fuchu	-	14	4
Jun	18-19	アートの力：静岡県藤枝市有機無農薬お茶栽培農家でのフィールド実習 IEAS “2011 Field Trip to Fujieda Organic	古市 Furuichi	静岡県藤枝 Fujieda,	人と農・自然をつなぐ会（杵塚農場） Kinezuka Farm	16	2

		Farm, Shizuoka"		Shizuoka			
Jul	20	伝統と現代のガーナ：農業、社会、そして環境 Lecture and Discussion: History, Society, and Environmental Issues in Africa and Ghana (Pre-study for Ghana Field Training)	尾崎 Ozaki	府中 Fuchu	高根務教授（東京農業大学）、Siaw-Onwona Agyeman 准教授（農工大） Prof. Tsutomu Takane, Tokyo University of Agriculture Assoc. Prof. Siaw-Onwona-Agyeman, TUAT	18	9
Sept	28	東日本大震災ボランティア報告・ガーナ海外フィールド実習速報 Report on volunteer activities in Tohoku Fresh Report from Ghana Field Training: "The Environmental Conservation in Africa: Through Modern Agriculture and Gold Mining in Ghana"	尾崎 Ozaki	府中 Fuchu	Siaw-Onwona Agyeman 准教授（農工大） Assoc. Prof. Siaw-Onwona-Agyeman, TUAT	14	5
Oct	28-29	上高地・松本フィールド実習～自然・歴史・観光・農業・研究 Field Trip with IAES: Kamikochi & Matsumoto, Nagano	二ノ宮 Ninomiya	長野県上高地・松本 Kamikochi & Matsumoto, Nagano	上高地ビジターセンター・自然公園指導員 Kamikochi Visitor Center Nature Guides	15 (21)	13
Nov	16	「持続可能なエネルギー戦略」現地訪問事前セミナー～地域からのエネルギーシフト Sustainable Energy Strategies: Energy Shift from Communities (Pre-lecture of Field Trip in December)	二ノ宮 Ninomiya	小金井 Koganei	環境政策エネルギー研究所（ISEP） 主任研究員 山下紀明氏 Mr. Noriaki Yamashita, Senior Researcher, Institute for Sustainable Energy Policies	10	6
Dec	5-7	持続可能なエネルギー戦略：エネルギーの地産地消へ向けた地方コミュニティーの挑戦～長野県飯田・伊那市訪問（第 3 回国際シンポジウムエクスカーション） Sustainable Energy Strategies: Challenges of local communities for introduction of locally generated renewable energy for local consumption (Field Trip/ Symposium Excursion)	二ノ宮 Ninomiya	長野県飯田市・伊那市 Iida/ Ina City, Nagano	おひさま進歩エネルギー株式会社・さくらファーム・三宜亭本館・飯田市立鼎みつば保育園・南信バイオマス共同組合・伊那谷自然エネルギー研究会・三峰川電力	19 (2)	11
Jan	11	「持続可能なエネルギー戦略」現地訪問事後セミナー～ふりかえり・関連研究発表・ディスカッション Sustainable Energy Strategies: Challenges of local communities for introduction of locally generated renewable energy for local consumption (Reflection on Field Trip in December)	二ノ宮 Ninomiya	府中 Fuchu		5	3
Mar	7-9	災害教育への導入～東北震災・津波被災地訪問とボランティア活動 An introduction to the disaster education: Field visits and volunteer activities in the affected areas of the Tohoku earthquake and	古市・二ノ宮 Furuichi/Ninomiya	宮城県気仙沼・南三陸 Kesennuma,	一般社団法人 RQ 災害教育センター RQ Disaster Education Center		2

		tsunami		Minami sanriku, Ishinomaki			
2012 年度/ Academic Year 2012							
May	16	2011 年度活動レビューと 2012 年度活動計画 Reflection on 2011 and Planning for 2012	二ノ宮 Ninomiya	府中 Fuchu	-	24	4
Jun	16-17	藤枝農山村実習 IEAS “2012 Field Trip to Fujieda Organic Farm, Shizuoka”	今井・米田 Imai/ Yoneda	静岡県藤枝 Fujieda, Shizuoka	人と農・自然をつなぐ会（杵塚農場） Kinezuka Farm	15 (8)	2
Jul	17	ベトナム事前学習会：メコンデルタの自然環境と農業、それらへの人為インパクト Pre-Lecture for Vietnam Field Training in Sept 2012	尾崎 Ozaki	府中 Fuchu	小杉正氏（アグレコ・コスギ）、多羅尾光徳准教授（農学府） Mr. Sho Kosugi, Agreco Kosugi, Assoc. Prof. Mitsunori Tarao (Faculty of Agriculture)	12	4
Oct	11-12	IEAS/FOLENS 黒部渓谷実習～再生可能エネルギー Field Trip with IEAS: Kurobe Canyon/ Renewable Energy	今井 Imai	黒部 Kurobe		7 (32)	10
Nov	19	東日本大震災・福島原発事故後の生活と農業～福島訪問事前講義 Preparatory Lecture for Field Trip: Life and Agriculture after Tohoku Earthquake and Fukushima Nuclear Disaster	二ノ宮 Ninomiya	府中 Fuchu	木村園子ドロテア准教授（農学府） Assoc. Prof. Sonoko Dorothea Kimura (Faculty of Agriculture)	22 (3)	7
Dec	17-18	東日本大震災・福島原発事故後の生活と農業～福島（二本松・南相馬）訪問 Fukushima Visit: Life and Agriculture after Tohoku Earthquake and Fukushima Nuclear Disaster	二ノ宮 Ninomiya	福島県二本松・南相馬 Nihonmatsu/ Minamisouma	武藤正敏氏ほか（ゆうきの里東和ふるさとづくり協議会） Mr. Masatoshi Muto (Committee for Organic Farming and Community Development in Towa)	26 (2)	3+ 4
Jan	15	東日本大震災・福島原発事故後の生活と農業～事後講義とディスカッション：自分たちにとっての原発・放射能問題を考える Reflective Workshop for Dec Field Trip: Agriculture and Radiation Pollution	二ノ宮 Ninomiya	府中 Fuchu	石丸偉丈氏(こどもみらい測定所) Mr. Yoshitake Ishimaru, Director, MEMOLI	21	2
Feb	28-3/1	北九州エコタウン・環境ミュージアムセミナー Kitakyushu Eco-Town and Environmental Museum Seminar	米田 Yoneda	府中 Fuchu			
Mar	22	持続可能な農業～藤野パーマカルチャー・センター・ジャパン訪問 Sustainable Agriculture – Visit to Fujino Permaculture Center Japan (PCCJ)	二ノ宮 Ninomiya	神奈川県藤野 Fujino, Kanagawa	設楽清和氏（PCCJ） Mr. Kiyokazu Shidara (PCCJ)		
2013 年度/ Academic Year 2013							
May	13	FOLENS セミナーへのいざない～2012 年度のふりかえりと 2013 年度の活動計画	二ノ宮 Nino	府中 Fuchu		24	4

		Reflection on 2012 and Planning for 2013	miya				
Jun	15-16	藤枝農山村実習 IEAS "2013 Field Trip to Fujieda Organic Farm, Shizuoka"	五味 Gomi	静岡県藤枝 Fujieda, Shizuoka	人と農・自然をつなぐ会/ IEAS faculty and students/Fujii Kinezuka Farm	17 (5)	2
Jun	26	チーム活動計画発表 Group Presentation on Activity Proposal	二ノ宮 Ninomiya	小金井 Koganei		31	7
Jul	12	タイ実習プレゼンテーション Workshop & Pre-Lecture for Thailand Field Training in Jul-Aug 2013	米田 Yoneda	府中 Fuchu			3
Aug	31	檜原村湯久保地区獅子舞奉納 Lion Dance Ceremony in Yukubo, Hinohara Village	二ノ宮 Ninomiya	東京都檜原村 Hinohara, Tokyo	檜原村の皆さん、朝岡幸彦教授（農学府） Hinohara Village/ Prof. Y. Asaoka (Faculty of Agriculture)	4 (3)	3
Oct	17-18	FOLENS セミナー 富士山実習 Field Trip with IEAS: Mt. Fuji, Shizuoka	五味 Gomi	富士山周辺 Mt. Fuji area		12(25)	11
Oct	22	せせらぎ農園訪問（有機農業チーム活動） Visit to Seseragi Community Farm, Hino (Organic Farming Team)	二ノ宮 Ninomiya	東京都日野市 Hino, Tokyo	佐藤美千代氏（まちの生ごみ活かし隊） Ms. M. Sato, Seseragi Community Farm	4	0
Dec	6	佐渡島実習事前セミナー（環境保全チーム企画）、せせらぎ農園訪問レポート、環境リーダー修了生ネットワーキング学生会合レポート Preparatory Seminar for Sadogashima (Environmental Conservation Team)	二ノ宮・尾崎 Ninomiya/ Ozaki	府中 Fuchu		24	3
Dec	8-11	トキを中心とした生物多様性保全と農業～佐渡島訪問 Environmental and Wildlife Conservation in Sadogashima Island (Environmental Conservation Team)	二ノ宮・尾崎 Ninomiya/ Ozaki	新潟県佐渡島 Sadogashima, Niigata	中島明夫氏ほか（新潟 NPO 協会） Mr. Akio Nakajima (Niigata Association of Nonprofits)	20	2
Jan	20	佐渡島実習事後セミナー FOLENS Seminar – Report of Sadogashima Trip	二ノ宮・尾崎 Ninomiya/ Ozaki	府中 Fuchu		15	3
Feb	20-21	北九州エコタウン・環境ミュージアムセミナー Kitakyushu Eco-Town and Environmental Museum Seminar	米田 Yoneda	北九州市 Kitakyusyu		10	1
2012-2013		FOLENS ファーム（農場活動）～持続可能な地域づくりと都市農業を考える FOLENS Farm Activities – Sustainable community development and urban agriculture		FOLENS 農場 FOLENS Farm			

2010 年度/ Academic Year 2010

テーマ/ Theme	FOLENS って何？／2010 年の活動計画 What is FOLENS?/ What should we do in FOLENS Seminars 2010?
日時/ Date	2010 年 6 月 10 日（水） / June 10, 2010
場所/ Venue	府中キャンパス / Fuchu Campus
参加者/ Participants	学生 16 名・教職員 6 名 / 7 students, 6 faculty & staff
プログラム/ Program	FOLENS セミナー計画案の作成/ Planning of FOLENS activities in 2010

FOLENS 開講第 1 回目となる FOLENS セミナーを、府中キャンパスで開催しました。今回のセミナーはワークショップ形式で行い、はじめにいくつかのアクティビティで場が和んだところで、現場立脚型環境リーダーに必要な資質やスキルとは何か、またそれらを身につけるために FOLENS セミナーで何を実施するかを話し合いました。

話し合いの結果、FOLENS の学生が感じている主なニーズとして、「さまざまな実際の経験を積むこと」「コミュニケーション能力を高めること」の二点が浮かび上がりました。6 月 16 日に行われたフォローアップ会議では、この二つに焦点をあてながら、FOLENS セミナー計画案を以下の通り組み立てました。7 月から、いよいよこれらを実施します。報告は随時当ウェブサイトに掲載していきます。

The very first FOLENS Seminar was held in Fuchu Campus. Thirteen students and six staff members attended. After icebreaking activities, the participants discussed necessary qualities and skills for a field-oriented environmental leader. They also exchanged ideas for this year's seminar programs to gain such qualities and skills. The discussion was facilitated in a casual workshop format.

The finding as a result was that the major needs of FOLENS students are in "having various hands-on experiences" and "developing communication skills". Focusing on these two needs, in a follow-up meeting on 16 June, the FOLENS Seminar program for 2010 has been tentatively designed as below. A report of each seminar will be uploaded to this website.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	藤枝農山村実習：持続的な環境と経営を目指す有機無農薬小規模農業への挑戦 /Fujieda Field Trip: Challenge of the organic, pesticide-free, small-scale farmers for the sustainable environment and livelihood
日時	2010 年 6 月 12～13 日/June 12-13, 2010
場所	静岡県藤枝市/Fujieda City Shizuoka Pref.
参加者	学生 7 名・教員 4 名/ 7 students & 4 faculty members
プログラム	･お茶・米・鶏などの有機無農薬農業を体験し学ぶ/Organic and non agrochemical cultivation in tea, rice and chicken ･地元農家や環境に関心のある都市住民と日本の農業と環境についての議論/Discuss on agriculture and environment with local farmers and city people

東京農工大学農学府国際環境農学専攻が主催した２日間（2010 年 6 月 12 日～13 日）の実習にＦＯＬＥＮＳからも７名の学生が参加しました。実習地となった静岡県中部藤枝市では、山間に狭い谷底氾濫原が形成されている典型的な日本の農山村地形景観を見ることが出来ます。実習は、お茶・米・鶏などの有機無農薬農業を体験し学ぶこと、そうして育てられた作物を味わうこと、そしてそれらの体験に基づいて地元農家や環境に関心のある都市住民と日本の農業と環境について議論すること、というプログラムで構成されました。

この地で先駆的に有機無農薬お茶栽培を始め、経営を軌道に載せている農家の方からお茶畑を案内頂き、有機無農薬栽培における土づくりの重要性を説明頂きました。土壌微生物が有機物を分解し、植物が吸収できる栄養分を生み出します。害虫の大発生も特にないそうです。有機無農薬農地では生態的な防除効果が期待できます。また、農作物市場における大企業の強い影響力について説明がありました。これには、ペット

ボトル入りのお茶をますます飲むようになっているという近年の消費者動向も関係しています。有機無農薬農業に対する誤解についてもお話がありました。有機無農薬農業は手間が掛かり生産経費が高い、という認識は状況によっては必ずしも正確ではなく、従って有機無農薬農家が不合理に高価な価格で販売していることもないそうです（中間業者や小売業者が時として価格を吊り上げていることがあるようです）。留学生の一部の関心は特に有機無農薬農業の生産コストに向けられていましたが、現場での話には新鮮な驚きがあったようです。最後のグループ討議は、実習での体験を咀嚼する良い機会になったと思われます。各グループは、地元農家、環境に関心のある都市住民（初心者から専門家まで）、日本人学生、留学生という多様な背景の人々で構成され、この多様さが議論を充実させたことは間違いありません。

今回の実習からは、日本における環境面・経営面で持続的な農業に関しての３つのコンセプトが浮かび上がったように思われました。小規模、消費者パワー（意識）、農地訪問、です。バーベキューで食べたイノシシ肉や有機無農薬野菜の味、そして有機無農薬のお茶のあの素晴らしい香りと一緒に、これらのコンセプトが思い返されればと思っています。

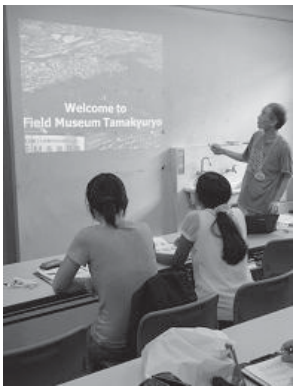
Seven FOLENS students have participated in a two-day field study organized by Department of International Environmental and Agricultural Science of TUAT (12-13 June 2010). The field was located in the central part of the Shizuoka prefecture, showing typical landform scenery of a Japanese mountain village; streams form narrow flood plains in the hilly-mountainous landscape. The field study involved several programs: learning and experiencing organic, pesticide-free farming (tea, rice, and chicken); tasting organic, pesticide-free foods; and discussing agriculture and environment with local farmers as well as environmentally-concerned people from urban areas.

A farm family in the area, who has run a pioneer, successful organic, pesticide-free tea farm, told in their tea field the importance of developing good soils for organic, pesticide-free farming. Micro-organisms decompose organic materials to absorbable forms of nutrients. Outbreak of pests is uncommon probably due to ecological controls in their organic, pesticide-free tea farm. They also emphasized the reality of agricultural markets which are significantly influenced by large agro-companies. It is related to a consumer custom of recent years – more and more people buy and drink tea in PET bottles. The family explained misconception about organic, pesticide-free farming; it is not necessarily more costly than the ordinary farming, and the organic, pesticide-free farmers have not provided the products with unreasonable prices (middlemen and retail markets tend to make high prices). Because some of the international participants were interested in production costs of organic, pesticide-free farming, the field information provided by the family seemed to be recognized with a surprise. The group-talk in the final session brought a good opportunity for students to digest the experience. Diversity of the group members – local farmers, environmentally-concerned people from urban areas (beginners to masters), Japanese students, and international students – clearly helped the discussion.

The field study seems to have suggested three key concepts for economically and environmentally sustainable Japanese agriculture: small-scale, consumer power (mind), and farm visit. These key concepts may be recalled with the tastes of BBQ of wild boar and organic vegetables… and, of course, the elegant aroma of organic tea. (21 June 2010; TF)

（古市剛久 / Takahisa Furuichi）

テーマ/ Theme	FM 多摩丘陵訪問～「環境」「科学」「現場」の意味を考える Visit to Field Museum Tamakyuryo - Working out What the "Environment," "Science," and "Field" Mean to Us
日時/ Date	2010 年 7 月 28 日/ July 28, 2010
場所/ Venue	東京農工大　フィールドミュージアム（FM）多摩丘陵/ Field Museum Tamakyuryo (FM Tamakyuryo), TUAT
参加者/ Participants	学生 8 名・教員 3 名/ 8 students & 3 faculty members
プログラム/ Program	
13:30-	京王線平山城址公園駅集合、FM 多摩丘陵まで徒歩移動 Meet at Hirayama-jyoshi Koen Station of Keio Line and walk to FM Tamakyuryo
14:00-	FM 多摩丘陵へ到着～はじめに：今日の予定 Arrival in FM Tamakyuryo/ Introduction: What are we doing this afternoon?
14:05-	講義：原宏教授（農学府） Lecture by Prof. Hiroshi Hara (Faculty of Agriculture)
15:00-	FM 多摩丘陵散策 Walk in FM Tamakyuryo – Guide by Prof. Hara
15:45-	休憩 Break
16:00-	フリーディスカッション Free Discussion
16:45-	Report of ITTO/IUCN/JICA international workshop on 'Biodiversity conservation in human influenced areas' by participated students 「ITTO/IUCN/JICA 共催公開討論：人為的な影響を受けた地域における生物多様性保全」参加学生による報告
17:00	終了 Closure



2010 年 7 月 28 日、第 2 回 FOLENS セミナーを開催し、8 名の学生と 3 名のスタッフが、FM 多摩丘陵を訪れました。FM 多摩丘陵は、本学フィールドサイエンス教育研究センターが持つ 8 か所のフィールドミュージアム（FM）のひとつです。今回のセミナーの目的はふたつ。ひとつは、「環境」「科学」「現場」の意味をどう理解することができるか考え、将来の環境リーダーとして自分たちの哲学的土台を見直すということ。そしてふたつめは、FM 多摩丘陵で現在行われている研究活動や今後の可能性について学ぶということでした。

真夏の強い日差しのもと、最寄駅から20分ほど歩いて到着したFM多摩丘陵では、ここに常駐されている原宏教授と学生さんが、FOLENSメンバーを温かく迎えてくださいました。セミナーは、原先生による講義で始まりました。FM多摩丘陵の地理的環境や研究設備等の紹介の後、「環境」、「科学」、「現場」の意味をどう考えるべきか、哲学的なお話がありました。科学と社会をつなげつつ結果と対策を意識する必要があること、問題を理解するために現場に立つ必要があること、知識が不十分な状態でも決断を下さねばいけない場面があること、これら3つが環境科学者の要件であるとの指摘がありました。また、現場での活動は「各人の世界観」を活性化し、そうした世界観が科学者としてオリジナルの研究に取り組むうえでの土台となるというお話もありました。

講義の後は、原先生のご案内によるFM多摩丘陵散策です。18メートルの高さがある研究用タワーを上る体験には、2名の学生が挑戦しました。散策を終えた後のディスカッションタイムでは、各学生より原先生に対し、FM多摩丘陵の研究活動や講義で話された哲学的議論について、活発な質問がありました。

最後に、先日「ITTO/IUCN/JICA共催公開討論：人為的な影響を受けた地域における生物多様性保全」に参加してきた3名の学生より内容の報告があり、終了となりました。

学生のコメントより

- 多摩丘陵を実際に訪れたこと、自然を感じたりフィールドでの研究の意味を学ぶことができたことが、自分にとってよい経験になりました。現場で得たものをどう使い、どう考えればよいのかということを学びました。環境を科学を用いて考えるときの意義について理解することができました。星座の話が興味深かったです。
- フィールドを訪問することが楽しかったです。このセミナーを通じて、科学に対する精神的な考え方を学びました。このトピックは非常に興味深いです。
- 多摩丘陵に行くのは初めてで、大気化学の研究についても学ぶことができたので、今回のセミナーはとても面白かったです。とても高いタワーや、生態系に関する長期調査についても興味深かったです。原先生の環境問題や科学哲学、環境学の特徴に関する講義もとても興味深かったです。今回のセミナーで私が学んだ3つの重要な点は、環境問題は人為的活動によるものだということ、酸性雨あるいは酸性沈着が環境問題のひとつとなっていること、そして現場は理論や実験よりも経験を与えるものだということです。

For the second FOLENS Seminar on 28 July 2010, eight students and three staff members of FOLENS visited Field Museum Tamakyuryo (FM Tamakyuryo), one of the facilities under TUAT Field Science Center. This seminar had two objectives - “To think about how we can understand the meanings of the environment, science, and field, and review our philosophical base as future environmental leaders” and “to learn about FM Tamakyuryo– current and potential research activities”.

After a twenty-minute walk from the nearest train station under the strong summer sun, the FOLENS group received a warm welcome by Professor Hiroshi Hara and his students stationed there. The seminar started with a lecture by Prof. Hara, which was divided into mainly two parts. The first was the introduction of FM Tamakyuryo—including its geographical overview and available research facilities. The second part dealt with philosophical discussion on the meanings of the environment, science, and field. He pointed out that there are three requirements for

environmental scientists, such as to keep in mind effects and measures looking at connections between science and society, to engage in field works to perceive problems, and to recognize the necessity to make decisions with limited knowledge. He also highlighted the importance of field activities to stimulate "one's view of the universe," which provides an essential basis for a scientist to develop one's original research.

After the lecture, Prof. Hara gave a guided tour around the FM. Some of the students enjoyed a challenging climb to the top of an eighteen-meter tower set up for research use. During the discussion time after the tour, students raised a variety of questions to the professor, trying to improve their understanding on research activities at the FM and also philosophical ideas introduced during the lecture.

At the end of the seminar, three students shared their repot on the ITTO/IUCN/JICA international workshop on 'Biodiversity conservation in human influenced areas' that they participated earlier.

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Students comments:

- I enjoyed actually visiting Tama Hills and feeling the nature and learning the meaning of research in the field. It was a good experience for me. I learned how to use or think about what I got from field. I could understand what the significance is when I think about the environment by using science. The story of constellation was interesting.
- I enjoyed the travel to visit the field. After this seminar I learned about psychological ideas of sciences. This topic is very interesting.
- The seminar was very interesting because I had never been there and I had a chance to know how they study about the atmospheric chemistry. It was particularly interesting to look at a very high tower and to learn about their long term ecological research. Hiroshi Hara sensei's lecture on environmental problems and the philosophy of science and the characteristics of environmental studies was also very interesting. There are three important points that I learned in this seminar: environmental problems are occurred due to anthropogenic activities; acid rain or acid deposition is also one of the environmental problems; and fields provide more experiences than theory and experiment.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	生物多様性とは？COP10 とは？ユースリーダーの役割とは？ What is Biodiversity? What is COP10? What is the Role of a Youth Leader?
日時/ Date	2010 年 8 月 10 日 14:00-17:00/ August 10, 2010
場所/ Venue	府中キャンパス / Fuchu Campus
参加者/ Participants	学生 10 名（うち FOLENS 生 6 名）・教職員 5 名 / 10 students (6 FOLENS students), 5 faculty & staff members
ゲスト/Guests	松井宏宇がけっぷちの生物多様性キャンペーン実行委員会代表／生物多様性条約市民ネットワーク運営委員／A SEED Japan／東京農工大学学生 犬塚千尋がけっぷちの生物多様性キャンペーン実行委員会／A SEED Japan／津田塾大学学生今井麻希子 COP10 おりがみプロジェクトメンバー／生物多様性条約市民ネットワーク事務局 Hirotaka Matsui: Director, Biodiversity on the Cliff! Campaign/ Committee Member, Japan Civil Network for CBD/ A SEED Japan/ Student, TUAT Chihiro Inuzuka: Biodiversity on the Cliff! Campaign/ A SEED Japan/Student, Tsuda College Makiko Imai: Member, Let's Origami! COP10 Project/ Secretariat, Japan Civil Network for CBD
プログラム/ Program	14:15- プログラム＆ゲスト講師の紹介 Introduction: Today's program and guests 14:20- 松井宏宇さん・犬塚千尋さんによる講義 Talk and Workshop by Mr. Hirotaka Matsui & Ms. Chihiro Inuzuka - Biodiversity on the Cliff! Campaign/ A SEED Japan 15:40- 休憩 Break 15:50- 今井麻希子さんによる「COP10 おりがみプロジェクト」ワークショップ "Let's Origami! COP10 Project" Workshop by Ms. Makiko Imai 16:30- フリーディスカッション Free Discussion 17:00 終了 Closure

10 月に計画している、COP10（生物多様性条約第 10 回締約国会議、於名古屋）へのフィールドトリップへ向けた、準備セッション（2 回予定しているうちの第 1 回）として実施しました。COP10 は、重要な環境イベントとして、人々やメディアの注目を広く集めていることから、今回のセミナーは FOLENS を履修していない学生にも公開し、6 名の FOLENS 学生のほか、国際環境農学専攻から 2 名、それ以外から 2 名、計 10 名の学生が参加しました。さらに、5 名の FOLENS スタッフと、お招きした 3 名のゲスト講師が出席しました。

セミナーの目的は、１）COP10 の背景や内容について学びフィールドトリップに備えること、２）COP10 に関わり活動するユース・リーダーと出会い、若者としてのリーダーが環境分野で果たすべき役割について考えること、３）各自の生物多様性との関わりについて、おりがみワークショップを通じて考える機会をもつこと、の 3 点でした。

まずはじめに、松井宏宇さんと犬塚千尋さんより、生物多様性や COP10 に関する概要について講義をしていただきました。松井さん、犬塚さんは、ともに生物多様性に関する運動に取り組む若き活動家であり、特に、当時、本学の学生でもあった松井さんは、「がけっぷちの生物多様性キャンペーン」実行委員会の代表や生物多様性条約市民ネットワークの運営委員を務めるなど、学生リーダーとして活躍していました。そうした経験の中で培われた視点から、松井さんには、ユース・リーダーが果たすべき役割についても話があり、若者に対する情報発信や啓発、政策提言、デモ活動の実施、他の NGO との連携、国際交渉への参画といった 5 つの役割が挙げられました。

講義に続いて、「COP10 おりがみプロジェクト」の今井麻希子さんによるワークショップがおこなわれました。このプロジェクトは、「生物多様性」という一見わかりにくい概念について、自分とのつながりやできることを人々がともに考える機会を、おりがみを折るという活動を通じて提供することを目的としているとの説明がありました。今回参加した留学生のほとんどが「おりがみは初めて」ということで、日本文化体験の機会にもなりました。できあがったおりがみ作品には、それぞれが 2020 年へ向けたメッセージや目標を書き込みました。

ワークショップの後は、お茶を飲みながらフリーディスカッションタイムをもちました。それぞれの学生が、自国の状況について紹介したり、それをよりよくしていくために何ができるか話し合ったり、また、生物種の価値を、その種が人間に与える利益から判断するということの妥当性についても議論がありました。

COP10へ向け準備するうえでのステップとして、基礎的な知識や経験を得る貴重な機会となりました。
＊今回のセミナーについて、ゲストの今井さんが書かれた記事が「環境 goo」にも掲載されました。
http://eco.goo.ne.jp/topics/environment/world/origami/news/12.html

学生のコメントより

- セミナーを通じて、生物多様性の大切さや、自分が将来やらねばならないことについて、理解することができました。FOLENSセミナーは、自分の専門分野を越えた事柄について学び、見方や考え方を他の人と交換することができるので、気に入っています。

- 若いリーダーによるお話がとても面白かったです。生物多様性について知ることができました。また、将来、環境分野の若いリーダーになるために、彼らをよいモデルとして、学ぶことができました。

- おりがみもおもしろかったです。生物多様性がいかに大切かを、みんなが気付くことができます。

「生命のシンプルな基礎：ハーモニーと共生」

- 私の国は、とても豊かな生物多様性という、自然による素晴らしい恵みを受けています。生物多様性保全は、健全な生態系や生活の質のために、とても重要です。私は、私の国のために、自然資源の持続可能な利用や持続可能な農業を通じて、生物多様性保全へ向けて働きたいと思います。

- 私の国では、生物多様性の急激な損失に直面しています。森林破壊や違法漁業が、緊急・長期的対応を必要とする重大な問題になっています。もしも私が、生物多様性保護のために働く機会を得たら、森林資源・漁獲資源の管理や回復に取り組みたいです。そして、そうした問題に関する資源管理や法的処置が改善され、人々が公平に、持続的に、自然資源による利益を得られるようになることが、私の夢です。

This seminar was the first of the two preparatory sessions for the field trip to COP10 (the tenth meeting of the Conference of the Parties to the Convention of Biological Diversity) in Nagoya, planned in October 2010 as part of the FOLENS seminar activities. Since COP10 is a major environmental event gathering wide attention of people and media in Japan, FOLENS opened this seminar also to students not enrolled in the program.

The seminar had three goals: to learn about the background and contents of COP10 as preparation for the field trip; to meet leaders of youth activists involved in COP10 and to think about the role of young leaders in an environmental sector; and to think about our own relationships with biodiversity through an Origami activity

First, Mr. Hirotaka Matsui and Ms. Chihiro Inuzuka gave a lecture on the overview of biodiversity issues and COP10. Mr. Matsui and Ms. Inuzuka are active members of youth involved in the biodiversity-related movement. Mr. Matsui, who was also a TUAT student then, was particularly playing a significant role as a student leader, being Director of the "Biodiversity on the Cliff!" Campaign and a committee member of Japan Civil Network for CBD. From such his viewpoint, he also proposed the five most important roles of youth leaders: to disperse information and promote education for youth, to propose policy recommendations, to hold demonstrations, to cooperate with other NGOs, and to participate in an international negotiation process.

Followed the lecture was a workshop by Ms. Makiko Imai from "Let's Origami! COP10 Project". The project aimed to provide people an opportunity to share thoughts on how each person is connected to and can act for biodiversity issues, through making origami. While this was the first origami experience for most of the international students, the workshop also gave an opportunity for introducing Japanese culture. At the end, each participant wrote a message or a target for 2020 on an origami craft they made.

After the workshop, participants enjoyed free discussion over a cup of tea. Some of the students shared the situations in their home country and exchanged ideas on how to improve it. Some others had a discussion on the relevance of valuing species based on benefits they provide to humans.

Through this seminar, thus, participants gained important knowledge and experience to prepare them for COP10.

*An article about this seminar for an internet media "Kankyo Goo", wrote by Ms. Imai, one of the guest speakers (only in Japanese)
http://eco.goo.ne.jp/topics/environment/world/origami/news/12.html

…….

Comments by students

- Through the seminar, I understand the importance of biodiversity, and my duty in future. I like the FOLENS seminars because I can learn topics beyond my specialty, and exchange views or ideas with others.

- The talk by the young leaders was very interesting. From their speech, I can learn more about biodiversity. Moreover, they are a good example to be learned from to be a young leader in Environmental sector in the future.

- Origami was also interesting. Everybody can realize how biodiversity is important for us.

"A simple basis of life; harmony and co-existence."

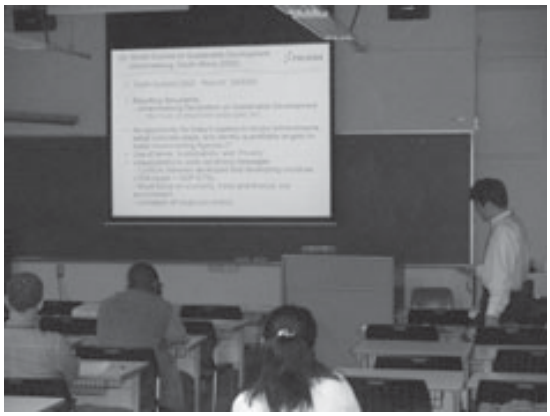
- My country is very rich in biodiversity. This is an excellent gift from nature. Biodiversity conservation is very important for health of ecosystem and quality of life.

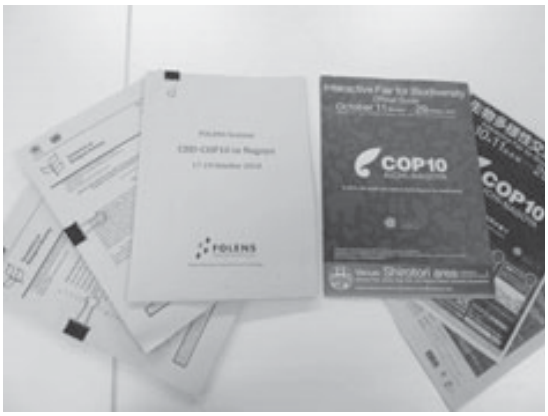
- So I would like to work for biodiversity conservation through sustainable use of natural resources and sustainable agriculture for my country.

- My country is facing a problem of rapid losing of biodiversity. The loss of forest and illegal fishing are a hot issue needing an immediate and long-term solution. If I have a chance to work for the protection activity of biodiversity, I would like to work to improve the forest and fish resource management and restoration in my country. Finally, my dream is to see the improvement of resource management and law enforcement related to the above problem so that my people can enjoy the benefit from the resource fairly and sustainably.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	生物多様性条約第 10 回締約国会議訪問 事前ブリーフィング/ **Pre-briefing for visit to CBD-COP10**
日時/ Date	2010 年 9 月 30 日/ September 30, 2010
場所/ Venue	農工大府中キャンパス/Fuchu Campus TUAT
参加者/ Participants	学生 7 名・教員 5 名/ 7 students & 5 faculty members
プログラム/ Program	・CBD-COP10 の概要と関連情報事前学習





FOLENS セミナーでは 10 月に名古屋で開催される生物多様性条約第 10 回締約国会議（CBD-COP10）を訪問する予定で準備を進めています。9 月の FOLENS セミナーでは、その準備として CBD-COP10 の概要と関連情報が概説された。FOLENS の古市特任准教授からは、訪問の目的、これまで開催されてきた環境関連の主要な国際会議の歴史、CBD-COP10 での主要な議題、また今回の会議での会場情報などの説明がありました。FOLENS の二ノ宮リム特任助教からは、様々な機関、団体、企業が出展するサイド・イベントの情報に関連した情報が提供されました。概説の後、参加する学生は 4 つのグループに分かれ、会議で調べる内容の検討を早速開始しました。FOLENS の訪問は 10 月 17 日（日）～19 日（火）、会議は 10 月 18 日（月）に開幕し、10 月 29 日（金）まで 2 週間に亘って続きます。

As to prepare the October FOLENS Seminar of visiting the 10th Meeting of Conference of the Parties to the Convention on Biological Diversity (CBD-COP10) in Nagoya, Japan, two introductory briefings were provided in the

September seminar. The first briefing by Taka Furuichi, Associate Professor of FOLENS, encompassed a range of introductions which included objectives of the visit, history of the major international environmental conferences, main agenda of the CBD-COP10, and site information of the Conference in Nagoya. The second briefing by Sachi Ninomiya-Lim, Assistant Professor of FOLENS, focused on side events of the CBD-COP10 organized and presented by various institutions, NGOs, and companies. After the two briefing, students visiting the CBD-COP10 formed four groups and started setting up themes of the group work in the CBD-COP10 in Nagoya. The visit will be from Sunday 17 to Tuesday 19 October. The CBD-COP10 will start on Monday 18 October and continue for two weeks until 29 October.

（古市剛久 / Takahisa Furuichi）

テーマ/ Theme	10 月 COP10-CBD 訪問フォローアップ　／12 月炭焼・里山ワークショップ プレビュー/ Follow-up for COP10-CBD in October/　Preparation for Charcoal & Satoyama Workshop in December
日時/ Date	2010 年 11 月 19 日/ November 19, 2010
場所/ Venue	農工大府中キャンパス/Fuchu Campus TUAT
参加者/ Participants	学生 16 名・教員 5 名/ 16 students & 5 faculty members
プログラム/ Program	・生物多様性条約第 10 回締約国会議まとめ/ Follow-up for COP10-CBD visit ・課題レポート発表/Presentation on the survey in the COP10

11 月の FOLENS セミナーでは、10 月の FOLENS セミナーのレビュー及び 12 月の FOLENS セミナーのプレビューを行いました。

10 月の FOLENS セミナーとして実施した「生物多様性条約第 10 回締約国会議（CBD-COP10）（名古屋）訪問」に関するレビューとして、まず FOLENS の古市特任准教授がまとめを行いました。名古屋 CBD-COP10 訪問の目的を改めて説明し、訪問時の活動を概観した上で、会議自体の結果としては、名古屋プロトコール（生物遺伝資源の利用と利益配分に関する議定書）の採択、愛知ターゲット（2011 年以降 2020 年まで達成すべき生物多様性に関する世界目標）の採択、IPBES（生物多様性と生態系サービスに関する政府間科学政策プラットフォーム）の設立勧告などの重要な進展を成し遂げたことが説明されました。こうした歴史的とも言える進展が見られたことから、会議に関しては大筋で成功したと言えるのではないかとの見解が示されました。

続いて、学生各グループがそれぞれ自ら設定した課題に関してレポートの発表を行いました。

グループＡ：COP10 の環境課題における国際機関の役割（ゴビンダ、福家、クイン）
グループＢ：農業に関わる生物多様性の重要性とその多様性の損出を補う方策（テイン、渡辺、島田）
グループＣ：生物多様性条約の適用に関する先進国と途上国のアプローチの比較
グループＤ：先進国と途上国の遺伝資源の利用に対する立場の調査

それぞれの発表の後には多くの質問が寄せられ、非常に活発な議論が展開されました。訪問を通じて得られた経験や知識が内部化され自発的な学びへと発展している様子が垣間見られました。同時に、CBD-COP10 訪問の 3 日間は履修生同士や教員と履修生が深く知り合う時間にもなったようです。CBD-COP10 を訪問し経験するという今回のセミナーは、2010 年度の FOLENS セミナーの中でも鍵となる活動となったように感じられました。

セミナー後半は、12 月の FOLENS セミナー「東京農工大学津久井フィールドミュージアム（神奈川県）訪問：持続的な環境と農業へ向けた炭焼きと里山」の概要と関連情報が、FOLENS の尾崎特任助教から概説されました。セミナーの目的は、炭焼きの原理と方法、炭の環境面での利用、炭焼きを含めた日本の農村景観・社会（それらの変化を含める）の背景としての里山、について理解を深めるとともに、アジア、アフリカ地域で共通する問題への応用について考えることにあります。炭焼きの原理や生産技術の概略、津久井フィールドミュージアムの様子、海外（ベトナム）における炭焼き普及活動の実例、などについてスライドに

より説明がありました。12月の FOLENS セミナーは、第2回 FOLENS 国際シンポジウム、農学府講義「国際環境農学特論２（アジア・アフリカ環境問題特論）」、及びＪＩＣＡ集団研修「アジア・アフリカ荒廃地植生回復」との共催で、12月6日（月）に実施される予定です。

1. Review-session of CBD-COP10

As to review the October FOLENS Seminar of visiting the 10th Meeting of Conference of the Parties to the Convention on Biological Diversity (CBD-COP10) in Nagoya, Japan, a summary was presented by Taka Furuichi, Associate Professor of FOLENS. The review first recalled the objectives of visiting CBD-COP10 and students activities in the venues. Then, three major outputs of the Conference were identified, namely (1) Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, (2) Strategic Plan for Biodiversity, 2011-2020 (Aichi Target), and (3) Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). The summary concluded that CBD-COP10 appeared to be successful by achieving the three major and other various important outputs of the conference.

Reporting presentations by student-groups followed in the seminar:

Group A: Role of international organizations in environmental issues in COP10 (Govinda Tililsina, Mitsutoshi Fuke, Pham Quynh)

Group B: The importance of agricultural biodiversity and how to gain back its loss (Ei Ei Theint, Tomoya Watanabe, Kojiro Shimada)

Group C: Comparison of approaches of developed countries with developing countries in applying biodiversity convention (Soklin Pheng, Tomoko Makita, Bessy Kho)

Group D: Investigation of standpoints for genetic resource use between developed and developing countries (Kei Kondo, Roeurn Siranet)

Active, stimulating discussion occurred after each presentation which proved students' positive participation in the CBD-COP visit. The three-day CBD-COP10 trip was also an opportunity for students to become to know each other, which FOLENS is subject to provide with. Overall, experiencing CBD-COP10 seemed to become a successful, key field activity of FOLENS in 2010.

2. Preview-session of Charcoal and Satoyama for Sustainable Environment and Agriculture

As to preview December FOLENS Seminar of visiting the Tsukui Field Museum of TUAT in Kanagawa-Prefecture, Japan, a preview briefing was provided by Hirokazu Ozaki, Assistant Professor of FOLENS. Primary objectives of the visit would be learning principles of charcoal production, environmental applications of charcoal, the concept of Satoyama as background of charcoal production as well as of Japanese rural landscape, community and their changes. Students were also expected to consider similar issues in Asia and Africa regions. Principles and method of

charcoal production was introduced, brief guide of the Tsukui Field Museum was presented, and an example of overseas extension (in Vietnam) of charcoal production was explained. The December seminar in the Tsukui Field Museum will be collaborated with the 2nd international symposium of FOLENS, a class of Graduate School of Agriculture 'The environment and sustainable society in Asia and Africa', and JICA training program 'Rehabilitation of degraded lands in Asia and Africa'. It is scheduled to be on 6 December 2010.

（古市剛久 / Takahisa Furuichi）

テーマ/ Theme	持続可能な農業と環境のための炭と里山（第2回国際シンポジウム・エクスカーション）/ Charcoal and Satoyama for Sustainable Agriculture and Environment (FOLENS International Symposium Excursion)
日時	2010年12月6日/December 6, 2010
場所	東京農工大　フィールドミュージアム（FM）津久井/ Field Museum Tsukui (FM Tsukui), TUAT
参加者	学生13名・教員12名/ 13 students & 12 faculty members
プログラム	・炭焼きの方法と利用/ How to make charcoal and its effective use ・日本の里山地域における持続可能な環境、農業、社会について考察/Sustainability of environment, agriculture and society in Japan's rural area ・アジア、アフリカ地域で共通する問題への応用について/Application to Asia and Africa for their similar cases

FM津久井でのもみ殻くん炭づくりの様子（中央右が指導して下さった及川先生）

エクスカーション午後の部。FM津久井周辺の里山を歩きました。

12月6日、第二回シンポジウムのエクスカーション＆12月FOLENSセミナーとして、FM津久井を訪問しました。訪問のテーマは、炭焼きの方法と利用、日本の里山地域における持続可能な環境、農業、社会について考察し、アジア、アフリカ地域で共通する問題への応用について考えるというものでした。炭焼きについては、国際環境農学の及川洋征先生の指導により、地域バイオマスを利用するもみ殻くん炭の作成と利用について、実演と講習を受けました。これは、JICAによる「アジア・アフリカ荒廃地植生回復」の海外研修生とも合同です。先生方も学生の方も、とくに海外からいらした方は、自国の農業や環境問題にどのように応用できるか興味津津のようでした。

お昼は、日だまりでみんなでお弁当を食べました。FM津久井のサポート学生さんがつくってくれたみそ汁もおいしかったです、どうもありがとうございます。

午後は、FM津久井で取り組んでいる養蚕施設と農場作物の見学、FM津久井周辺に点在する地蔵尊や石碑、地形、植生、森林管理など今日の“里山”地域における自然、文化、環境問題などについて、近場のスポ

ットを見て回りました。もちろん、日本の自然や文化を紹介するとともに、アジア、アフリカ各国での様子も参加者から話してもらいました。

FM 津久井の訪問は、ねらい通り、参加したみなさんにとってただの観光ツアーとは違ったようで、「日本は高層ビルや先端技術といったイメージが強かったが、伝統や自然などについて知ることができた」や、「自国との違いの中にも共通点があって面白かった」、「より深い交流をもつ機会となった」など教員および学生の双方から好意的な感想を聞くことができました。

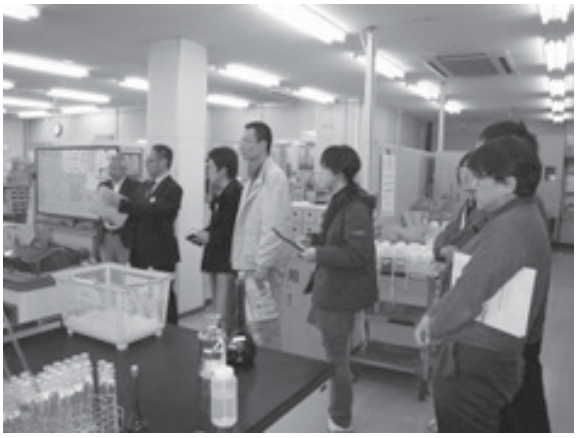
We visited FM Tsukui, one of the test farmland of TUAT, on December 6th. This is the joint excursion of the second international symposium of FOLENS and FOLENS seminar in December. The focuses were to understand charcoal production and its application, sustainable environment, agriculture and society of “Satoyama” area in Japan and consider similar issues in Asia and Africa regions. Dr. Oikawa, in Department of International Environmental and Agricultural Science (IEAS), kindly instructed how to produce and apply rice husk charcoal from the local biomass resources (photo). The demonstration and instruction was held together with foreign trainees of “Rehabilitation of degraded lands in Asia and Africa” by JICA. Many of us especially overseas participants were very much interested in application to their agriculture and environment.

We had outdoor lunch together under the warm sunlight. Supporter students (IEAS) provided us tasty miso soup. Thank you very much. We walked around FM Tsukui to see farmland for silkworm, vegetable and citrus production in the afternoon. Old local culture, topography, vegetation and forest management were topics during the walk (photo 3). Foreign participants from Asia and Africa also introduced similar and comparable culture in their country. The visit to FM Tsukui seemed to be interesting for everyone, as we expected, since it was not just a sightseeing tour. They gave us positive impressions such as “I learned nature and tradition of Japan, it is not only tall buildings and advanced technologies”, “I found common aspects within the general differences between hometown and Japan”, “I am more familiar to the friends” and so on.

（尾崎宏和/Hirokazu Ozaki）

テーマ/ Theme	廃棄物問題：廃棄物処理施設・環境データ分析企業見学/ Solid Waste Management – Visit to Waste Treatment Complex & Environmental Data Analysis Facility
日時/ Date	2011 年 2 月 22-23 日/ Feb. 22-23, 2011
場所/ Venue	名張、四日市/ Nabari and Yokkaichi
参加者/ Participants	学生 3 名、教員 4 名 / 3 students & 4 faculty members
プログラム/ Program	・「三重中央開発株式会社・三重総合リサイクルセンター」での実習（名張）/ Mie Comprehensive Recycle Center of Mie Chuo Kaihatsu ・「株式会社東海テクノ・四日市分析センター」での実習（四日市）/ Yokkaichi Analysis Center of Tokai Techno

廃棄物最終処分場/Final Landfill



環境分析の作業プロセスについて学ぶ/Studying the environmental analytical work process

2 月の FOLENS セミナーは、谷口紳先生がとりまとめ、再びフィールドへ。今回は廃棄物の適正な処理、環境分析ラボでの作業における注意点について勉強しました。場所は名張と四日市。冬晴れの鈴鹿は雪をかぶった御在所岳が新鮮でした。名古屋から、その鈴鹿を越えて名張へ。車窓には風力発電所も見ることができます。 名張では国内有数の廃棄物処理施設である「三重中央開発株式会社・三重総合リサイクルセンター」に実習を受け入れていただきました。有害物質の管理はもちろんのこと、物質の循環、情報公開と社会的合意が不可欠であることを学びました。 また、四日市では、民間の環境分析機関であり、その高いクオリティコントロールで知られる「株式会社東海テクノ・四日市分析センター」を訪問させていただきました。公害の歴史も含んだ環境問題への認識を現地で感じつつ、試料取り扱いでの一連の作業プロセスにおける統括的運用が、大学の研究室での作業にも取り入れられる点が多そうです。 見学後のディスカッションでは、廃棄物問題はまさに十数年後の将来を見据えた取り組みが必要で、それにはさまざまな側面からのアプローチが有りうること、それは私たちが個々に積み上げて行く必要があるものだとの認識を共有しました。榊原温泉での宿泊は、FOLENS の親睦を深めるためにも良いものとなりました。

It was a nice visit to a field again in February by Taniguchi Sensei’s coordination. The focuses were an appropriate waste treatment and notes on laboratory work for environmental analysis. The destinations were Nabari and Yokkaichi in Mie Prefecture. Mt. Gozaisho with pure snow was crisp in the winter sunlight. Train went through the mountains, with wind power generation plant on our window view, arriving at Nabari.

In Nabari, we visited Mie Comprehensive Recycle Center of Mie Chuo Kaihatsu, one of the largest recycling complexes in Japan. There, we learned harmful material control, and the importance of achieving material recycling, public information sharing and social consensus for waste management.

On the second day, we visited Yokkaichi Analysis Center of Tokai Techno, a privately run environmental data analysis facility known for its high quality control capability. The city of Yokkaichi has a severe environmental pollution history. The laboratory there gave us an idea of overarching process for sample treatment.

At the end of the trip, we had a fruitful discussion to recognize that future vision of the society is needed for waste management, thus there are many approaches and we can individually accumulate for this big concern. Sakakibara-Onsen was a pleasant night for our friendship.

(谷口紳、尾崎宏和/Shi Taniguchi, Hirokazu Ozaki)

2011 年度/ Academic Year 2011

テーマ/ Theme	FOLENS とは何か？2010 年度ふりかえりと 2011 年度活動計画 What is FOLENS? Reflection on 2010 and Planning for 2011
日時/ Date	2011 年 4 月 28 日/ 28 April 2011
場所/ Venue	府中キャンパス/ Fuchu Campus
参加者/ Participants	学生 16 名・教員 4 名 / 16 students & 4 faculty members
プログラム/ Program	10:00- Introduction: What are we doing today? 10:10- What is “Field-oriented Leaders in Environmental Sectors”? ～Exchange views on “FOLENS” 10:50- Reflection: FOLENS Seminar Activities in 2010 ～Reflect on what we did and what we learned 11:20- Sharing Ideas on What to Do in FOLENS Seminars ～Share ideas on what we want to do through FOLENS Seminars in 2011 12:00 Closure – Lunch!

ウォーミングアップ Warm-up

現場立脚型環境リーダー（＝FOLENS）になるために・・今年は何をしよう？ What do we want to do this year … for becoming “field-oriented leaders in environmental sectors”!?

様々なアイディアが出される中、東日本大震災に関するテーマに関心が集まりました。
Many of the participants shared a strong interest in topics related to the Earthquake-Tsunami disaster in eastern Japan on 11 March

この 4 月から新たに FOLENS プログラムに加わった第 3 期生にとっては、初めてのセミナーを実施しました。今日の目標は、「FOLENS とは何か（＝現場立脚型の環境リーダー像）」、考えを分かち合い、それをもとに今後のセミナー計画のアイディアを出し合うこと。学生自らの関心や需要に沿った学習を基本とする FOLENS セミナーだからこそ、こうした話し合いはとても重要です。

まずはウォームアップのため、今朝起きた時間、キャンパスから自宅までの距離、過去訪れた国の数・・・など様々な質問に応じて列をつくる簡単なゲームで体と口を動かした後、グループに分かれて「現場立脚型環境リーダー“FOLENS”とは何か？」を話し合いました。話し合う中で最も大切だと思ったことを全体で発表し合ったところ、以下のような答えが並びました（写真参照）。

・環境のつながり：多様な分野の専門性をつなぐ
・コミュニケーション
・コラボレーション
・多角的な視点：文化、社会・・・
・世界規模の視野
・ボトムアップアプローチ
・理論だけではなく現場から
・現場の知識や経験
・地元住民と専門家の知識のギャップ：知識のレベルのギャップ？それとも知識の種類のギャップ？
・前向きな変化を推進する～とても難しいことがある～家族から地域、世界へ！
・未来のリーダーはよいフォロワー

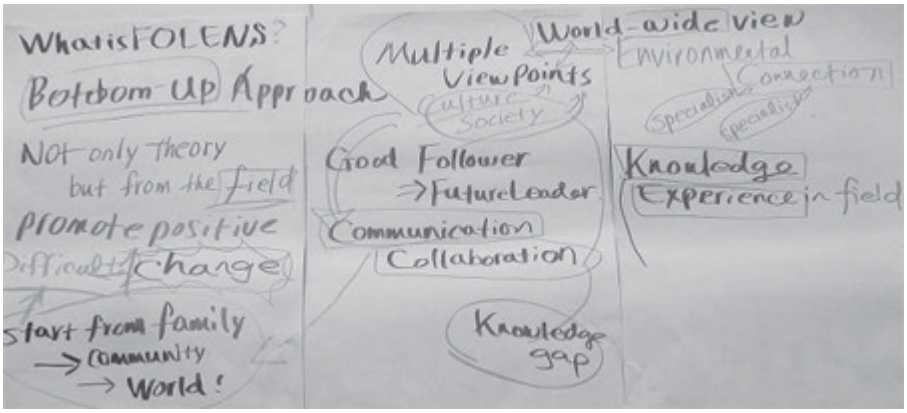
次に、2010 年度の FOLENS セミナーを、スライドを見ながらふりかえった後、昨年度の経験や「FOLENS とは何か」を踏まえた 2011 年のセミナー計画について、再度グループごとにアイディアを話し合いました。最後に全体で共有したところ、災害、エネルギー、放射能汚染、ボランティアなど、特に 3 月 11 日の東日本大震災に関連したテーマに関心が集まったことから、次回のセミナーで、再度、震災とその後に焦点を当てたディスカッションを持ったうえで、今年度のセミナー計画を最終化することとしました。

On 28 April, we had the first FOLENS Seminar in the academic year 2011. This was also the very first seminar for those students who just joined FOLENS a week before. The seminar’s goal was to exchange views on “FOLENS” and ideas on what to do in 2011. Such a discussion is very important to start the year, while one of the important objectives of the FOLENS Seminars is to promote learning based on students’ own interests and needs.

We started the session with an ice-breaking activity, where everyone moved around and chatted with each other to create a line in various orders such as the time you woke up this morning, the number of countries you have visited, and so on. After warming up, we discussed what “Field-Oriented Environmental Leaders” are in three groups. Following the group discussion, students shared ideas that they thought most important and/or impressive, as shown below.

Next, we reflected on FOLENS seminar activities in 2010 by looking at slides, with explanation by faculty and students who participated in them.

Finally, we discussed ideas on activities for this year's FOLENS seminars in groups, based on our image of FOLENS and experience from the last year. While sharing ideas at the end, we realized that many of us had a strong interest in the topics related to the Earthquake-Tsunami disaster in eastern Japan on 11 March, such as natural disasters, energy, radioactive contamination, and volunteers. Based on this finding, we decided to have a discussion in the next seminar, especially on what have happened on March 11 and afterward, before finalizing this year's plan.



「現場立脚型環境リーダー“FOLENS”とは何か？」の話し合いから
Ideas shared after the group discussion on “What is Field-Oriented Environmental Leader?”

（二ノ宮リムさち／Sachi Ninomiya-Lim）

テーマ/ Theme	3.11 とわたしたち 3.11 and Us
日時/ Date	2011 年 5 月 18 日 / 18 May 2011
場所/ Venue	府中キャンパス / Fuchu Campus
参加者/ Participants	学生 14 名・教員 4 名 / 14 students & 4 faculty members
プログラム/ Program	・今日の流れと前回のふりかえり ・自己紹介＆共有～3.11 とわたし ・グループワーク～3.11 マップを作る ・ディスカッション～今年度活動で取組む 3.11 関連課題 ・ふりかえり · Introduction: What are we doing today? ～Reflection on discussion in the previous seminar · Self-Introduction & Sharing: 3.11 and Me ～Share personal experience of and reflection on “3.11” or the Tohoku Great Earthquake and its related inciden · Group Work: Create a Map of 3.11 ～Create a map (geography, concept, and timeline) of 3.11 and discuss what “3.11” implies in relation to FOLENS · Discussion: 3.11-related Topic(s) of FOLENS Seminars 2011 ～Pick up 3.11-related topics to cover in this year’s FOLENS seminars · Discussion: Other Topics/ Activities of FOLENS Seminars 2011 ～Share ideas on what we want to do through FOLENS Seminars in 2011 · Closure

コンセプト（概念）・マップ Concept Map

ジオグラフィカル・マップ（地図）
Geographical Map

ロード（工程）・マップ Road Map

今回のテーマは、前回のセミナーで今年度の活動アイディアを出し合った際、3月 11日の東日本大震災に関連したテーマに関心が集まったことを受けて、「３．１１とわたしたち」。東北地方の被災地はもちろん、私たちを含む日本社会、そして世界に甚大な衝撃を与え続けている大震災や原子力発電所の問題、その後の状況を話し合いながら、FOLENS にとって「３．１１」が持つ意味を見出し、今後の活動計画を策定することが目的でした。

初めに、グループに分かれ、それぞれの「３．１１」の経験や、関連して起きた様々な出来事について感じたことを分かち合います。4 月から新たなメンバーが加わり、今日が初対面となる学生同士も多いことから、自己紹介を兼ねながらそれぞれの個人的な思いを聞き合いました。

次に、グループごとに大震災とその後に起きた様々な事象を整理するため、3 種類の「マップ」を作成します。一つ目は、「地理的マップ」、つまり震災から続く様々な出来事を地図上に表すもの。二つ目は、出来事とその影響や対応などを、互いの関係を示しながら思いつくまま書きだしていく「コンセプト・マップ」。そして最後に「ロード・マップ」、つまり出来事やそれへの対処を時間軸上に記すもの。グループごとに一つずつマップを完成させたところ、非常に広範に及ぶ大震災と関連する出来事の全体像と、それぞれが関心を持っている事項が、だんだんと見えてきました。

このマップから、今後の FOLENS セミナーで特に取り上げるべきテーマを抽出したところ、「放射能汚染除去」と「エネルギー（太陽光、水力、バイオマス、風力などの代替エネルギー・東北地方の生活再建へ向けたエネルギー供給）」の二つに絞られました。（これらについて、後日学生メーリングリストでも意見を募ったところ、「エネルギー」を、12 月に予定している宿泊型フィールドトリップとその前後のセミナーのテーマとすることを決定しました。）

また最後に、被災地でのボランティア活動について、学生から提案がありました。「経験のない者がボランティアに行くとかえって現地の迷惑にならないか」と言った意見も出され、議論となりましたが、「被災地では実際に人手が非常に不足している。現地の方々への配慮については当然事前によく考え、注意せねばならないが、役に立てることは必ずある。」というアドバイスもあり、今後計画を進めることとなりました。

While we found at the previous seminar that many had a strong interest in the topics related to the Earthquake-Tsunami Disaster in eastern Japan on 11 March, including the Fukushima-Daiichi nuclear power plant accident and its dreadful effects, the goals of the day were: 1) to share our experience of and reflection on “3.11” and its related incidents, and discuss what “3.11” implies in relation to FOLENS; and 2) to decide topics/activities for this year’s FOLENS seminars.

First, we were divided into small groups and shared personal experience of and reflection on “3.11” and its related incidents. As some of the participants were new students just joined in April and many did not know each other, self-introduction was also exchanged.

Following that, we created three maps of 3.11. One was a geographical map, where the earthquake and tsunami and following incidents were placed on a geographical picture of Japan and surrounding areas. Another was a concept map, in which a web of various incidents and their effects etc. and their relationships was drawn. The third map was a road map, which showed a timeline of what have happened and countermeasures to those. After each group created one of these maps, we could gradually understand a whole picture of so many related incidents and topics to the earthquake on March 11 and what have happened afterward.

Based on these maps, we discussed what topics we should focus on in FOLENS seminar activities this year. As a result, the two topics that we found that we were particularly interested in were: 1) Radiation contamination treatment; and 2) Energy (eg. Possibility of new energy sources such as solar, hydro, biomass, wind etc./ Energy supply for rebuilding lives in Tohoku). (After the seminar, we continued discussion through students' mailing list and decided "energy" to be the main topic of a three-day field trip in December with pre-study in November and post-study in January).

At the end of the seminar, some students proposed that FOLENS should conduct volunteer activities in Tohoku, the area severely damaged by the earthquake and tsunami. While some expressed their concern to cause a trouble for local residents there if inexperienced students simply join volunteer activities, a faculty member advised that although it is surely important to make enough consideration not to trouble local people, certainly there is a great need for manpower there and anyone could be of some help. We decided to start planning for this.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	静岡県藤枝市有機無農薬お茶栽培農家でのフィールド実習/Field Trip to Fujieda Organic Farm, Shizuoka”
日時/ Date	2011 年 6 月 18～19 日/ Ｊｕｎｅ 18-19, 2011
場所/ Venue	静岡県藤枝市/ Fujieda City Shizuoka Prefecture
参加者/ Participants	学生 16 名、教員 2 名/ 16 students & 2 faculty members
プログラム/ Program	・茶畑見学、田植え/ Tea plantation visit and rice nursery transplanting ・地元農家や環境に関心のある都市住民と日本の農業と環境についての議論/Discuss on agriculture and environment with local farmers and city people

今年の春の藤枝実習の一日目はあいにくと梅雨空でした。農学府国際環境農学専攻が主催するこの実習をこの春から FOLENS でも「FOLENS セミナー」として位置付けさせて頂き、16 名の FOLENS 生が参加しました。農工大の学生だけではなく、有機無農薬お茶栽培に関心を持つ市民の方々も各地から集り、昨年と同様に大変賑やかな学びの機会となりました。典型的な日本の農山村地形景観の中で有機無農薬お茶栽培を営む杵塚家の皆さんが、今年も快く参加者を受入れて下さいました。

実習の内容は今年も盛り沢山でした。到着後直ぐに山の頂部にある茶畑を見学しました。杵塚家の御主人が有機無農薬お茶栽培について説明下さいましたが、時節柄福島第一原子力発電所での事故による放射性物質の拡散、お茶の葉への取り込みと集積、その事態への対応の話にもなり、現場から 400km 離れた中部地方にも原発事故の影響が及んでいることを強く印象付けられました。集会所に戻ると、東京でレストランを営みながら『減速して生きる』という本を出すなど新たなライフスタイルを実践し提案している高坂勝さんの講演を聞きました。様々な数字を挙げながら、成長を原則とした経済の枠組みに取り込まれ浪費し疲弊する生活のあり方に疑問を投げかけ、よりスローな生活を提案されています（学生から提出されるレポートでは提案されたスロー・スタイルに関するコメントが寄せられることでしょう）。講演後は大阪を拠点に活動する「まーちゃんバンド」のライブでした。まーちゃんバンドは原発事故に苦しむ福島の人々への同情を含め環境に関するメッセージも発信し続けいているグループで、観客と一体となるステージは、楽しく、時に心地よく、心に訴えるものがあり、優れたパフォーマンスの力で効果的に彼らのメッセージを伝えていました。ライブの後は夕食のバーベキューを楽しみました。大学院で学ぶ学生が鶏を絞めて顔をしかめている、蛍の光を見つけて歓声をあげているなど、この間も有機食材の味を楽しみながら様々なことが巻き起こっていました。二日目の朝、田んぼの農業用水を川から引き排水するシステムを見学し、その後田んぼで田植えをしている間は、幸いにも雨は降りませんでした。田植えの後には二日間の経験を話し合うグループディスカッションがもたれ、様々な内容について話し合われた結果が発表され、共有されました。

藤枝「スクール」はいつも驚きと発見の連続です。参加には様々な発想とその実践を受容する柔軟性が試されます。今回経験したライブはその典型でした。まーちゃんバンドのステージは聴衆の心を引き付け、一つにし、メッセージを印象づけることに見事に成功しており、環境ネットワーキング（FOLENS 理念の一つ）を行っていく際の「アートの力」を立証していました。「最近少し頭が固くなったな」と思ったら、藤枝スクールに参加してみて下さい。

It was rainy again – the first day of this second year field trip to the Fujieda organic farm was a typical day of 'Baiu (the rainy season)' in Japan. Sixteen FOLENS students participated in the two-day field study organized by Department of International Environmental and Agricultural Science (IEAS) of TUAT. With kind permission by IEAS, FOLENS became a co-organizer and placed this field trip as one of FOLENS Seminar. Not only students from TUAT but also, same as last year, a number of people who were interested in the organic tea farming participated in this field study. The Kinezuka Family, the Fujieda organic farm owner, welcomed all the participants in the typical landform scenery of a Japanese mountain village.

Plenty of activities in various aspects were involved. Right after the arrival, the participants visited a tea farm on the top of the hill and Mr. Kinezuka explained his practice of organic, pesticide-free tea farming. Given the Fukushima Daiichi nuclear power plant accident and subsequent fallout of radionuclides, much of the talk by Mr. Kinezuka was about situation of accumulation level of radioactive cesium in tea leaves and their response to it. A negative impact of the nuclear plant accident has certainly spread even over the Chubu Area, 400 km away from the Fukushima Daiichi. After coming back to the lodge, a lecture by a restaurant owner in Tokyo, Mr. Masaru Kosaka, who wrote a book titled 'Living downshifted' was provided. He argued feasibility of growth-based economy in the present world and proposed so-called 'slow life'. His discussion involved various unique aspects in questioning the current prevailing lifestyles in cities under strong influence of the growth-based economy and suggested alternatives (I expect some reports by students would discuss on his alternatives). Then, after the lecture, a music band from Osaka presented their wonderful music and dance performance. The band had strong messages on the environment, including the suffering people in Fukushima, and conveyed the messages quite effectively through the performance. After the show, the dinner barbeque using organic ingredients began and some students dealt with and prepared chickens for it. A night tour for finding fireflies was not forgotten. In the morning of the second day, it was not raining during the time of observing paddy irrigation system and transplanting rice seedling in the paddy field. Finally, wrap-up group discussions were conducted among the participants on diverse issues related to the two-day experience.

The Fujieda field 'school' is always full of surprise and discovery. Flexibility is required to participate in the school. The music performance was a typical example of the surprise and discovery; it clearly demonstrated the power of arts in networking for the environmental activities. If you feel your brain is a bit stiff in these days, come to Fujieda.

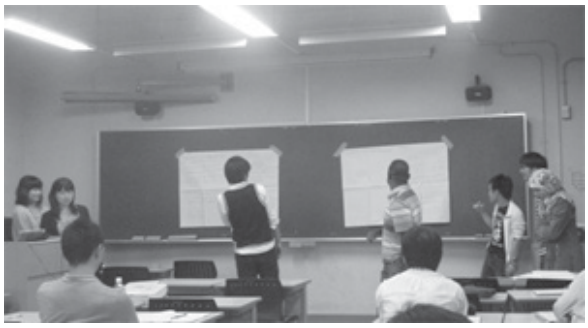
テーマ/ Theme	伝統と現代のガーナ：農業、社会、そして環境 (ガーナ実習事前学習)/ Lecture and Discussion: History, Society, and Environmental Issues in Africa and Ghana (Pre-study for Ghana Field Training)
日時/ Date	2011 年 7 月 20 日/ July 20, 2011
場所/ Venue	府中キャンパス / Fuchu Campus
参加者/ Participants	学生 18 名・教員 9 名/ 18 students & 9 faculty members
プログラム/ Program	高根務教授（東京農業大学）、Siaw-Onwona Agyeman 准教授（農工大）によるガーナの農業、環境、社会、経済に関する講義/Lecture on agriculture, environment, society and economy of Ghana by Prof. Tsutomu Takane(Tokyo Univ. Agr.) and Siaw-Onwona-Agyeman(TUAT)

高根先生によるガーナの地理、気候と作付作物の分布の関連の説明

FOLENS の今後の最大イベント・ガーナ実習に臨むため、ガーナに関してみんなで学ぼうという機会です。東京農業大学の高根務先生、本学の Siaw Onwona-Agyeman 先生を招聘し、現地の社会と歴史、人々の生活、農業、環境問題に関して講義をしていただきました。高根先生は、ガーナ農業の主要作物であるカカオとパイナップルにおける違い、Agyeman 先生はガーナの人々の生活、土壌流出、鉱山採掘などを中心に話をしてくださいました。今回は貴重な機会でしたので、公開セミナーとして実施したため、参加者は FOLENS メンバーだけでなく、講義後は質問が多く交わされました。 (HO)

It was a pre-study seminar for the overseas field training in Ghana in coming September and also an open seminar for all those who are interested in it as well as FOLENS students. We had two lecturers, one was Professor Tsutomu Takane from Tokyo University of Agriculture and the other was Associate Professor Siaw Onwona-Agyeman from TUAT. The topic was “Traditional and modern Ghana: Agriculture, society and the environment”. Takane sensei put a focus on contrast between cacao and pineapple which are both major agricultural products in Ghana. Agyeman sensei spoke about people’s life, soil erosion and gold mining. There exchanged active questions and answers after the lecture. (HO)

テーマ/ Theme	東日本大震災ボランティア報告・ガーナ海外フィールド実習速報/ Report on volunteer activities in Tohoku and Fresh Report on Ghana Field Training
日時/ Date	2011 年 9 月 28 日/ September 28, 2011
場所/ Venue	府中キャンパス / Fuchu Campus
参加者/ Participants	学生 14 名・教員 5 名/ 14 students & 5 faculty members
プログラム/ Program	・石巻での震災復興ボランティアに参加した実地報告/ Report on volunteer activities for reconstruction from the earthquake in Ishinomaki ・ガーナで行われた海外フィールド実習についての報告/ Fresh Report on Ghana Field Training



議論にあたって、ガーナ出身の本学教員アジマン先生からも大いに情報やコメントもらいました

ガーナ実習での活動速報

9 月 28 日 16 時から 18 時半まで、9 月の FOLENS セミナーが行われました。今回は、石巻での震災復興ボランティアに参加した実地報告（周東）と、ガーナで行われた海外フィールド実習について、7 人の参加学生（Rola、肖、牧田、山口、沼尻、宮崎、鉄田）による活動速報が行われました。

周東君の報告は、本当に身近な人から、現地で活動した生の情報を聞く貴重な機会でありました。活動の内容、地震と津波被害の状況の地域的違い、ボランティア参加の方法が報告され、質疑応答では、今後の復興計画における市民と行政の役割、その分担とバランスに関する指摘がありました。

ガーナ実習参加の 7 人は、訪問の目的、調査の内容と結果、調査を行う際の工夫や苦労、今後の展望、ガーナの学生の方との討論や交流で感じたことを報告しました。土壌や水の海外での現地測定、地元の方から直接情報を得た体験、現地の生活や食事に関する速報で、楽しいセミナーとなりました。

FOLENS seminar in September was held between 16:00 and 18:30, on 28th September, 2011. Naotaka Shuto reported his volunteer work in Ishinomaki City for the recovery from the Great East Japan Earthquake. Another main content was a fresh report of overseas field training in Ghana by Rola, Xiao, Makita, Yamaguchi, Numajiri, Miyazaki and Tetsuda.

The report by Mr. Shuto gave us a valuable opportunity to listen to the raw information based on an on-site activity. He talked about the content of the work, the situation of damages caused by the earthquake and tsunami, and a

procedure to participate in a volunteer group. Roles of citizens and governments were pointed out in his presentation. In the following Q&A session, we discussed the importance of a balance of their contributions to the reconstruction.

The fresh reports on Ghana included objectives, contents, and results of their work, as well as challenges they faced and attempts they made during their activities. Their impressions from discussion with students in Ghana, and their future visions for further study and career development were also reported. Each student gave a lively story of their experiences there and it facilitated the other students' interests in the environment and society of Ghana.

テーマ/ Theme	上高地・松本フィールド実習～自然・歴史・観光・農業・研究 Kamikochi/ Matsumoto Field Trip – Nature, History, Tourism, Agriculture, and Research
日時/ Date	2011 年 10 月 28 日（金）～29(土) / October 28 (Fri) -29 (Sat)
場所/ Venue	上高地・松本 / Kamikochi & Matsumoto
参加者/ Participants	学生 36 名（うち FOLENS 生 17 名）・教員 14 名 / 36 students (17 FOLENS) & 14 faculty members
プログラム/ Program	10 月 28 日（金） 7:00 農工大府中キャンパス出発 11:00 上高地到着、講義・ガイドトレッキング（大正池、河童橋～明神池） 16:00 宿泊地到着 17:30 夕食・パーティ 10 月 28 日（土） 7:00 朝食 8:30 出発 9:30 蚕業革新発祥記念碑 10:00 松本城（英語ガイド） 12:30 大王わさび農場 15:00 出発 19:00 府中到着 Friday, 28 October 7:00 Departing TUAT Fuchu Campus 11:00 Arriving in Kamikochi, Nagano Prefecture Lecture & guided trekking (Taisho Pond, Meijin Pond) - Natural environment (geography, vegetation and wildlife) - Eco-tourism and its environmental impact 16:00 Arriving in accommodation/ Dinner preparation 17:30 Dinner/ Party Saturday, 29 October 7:00 Breakfast 8:30 Departing accommodation 9:30 Monument for the innovation of sericulture 10:00 Matsumoto Castle (English guide available) 12:30 Lunch at Daio Wasabi Farm - Filming site of "Dreams" (a movie by Director Akira Kurosawa) 15:00 Departing Daio Wasabi Farm 19:00 Arriving in Fuchu

2011年 10月の FOLENSセミナーでは、農学府国際環境農学専攻の「国際環境農学国内外実習」との共同開催 で、一泊 二日の行程で長野県の上高地・松本を訪問しました。

一日目：

農工大府中キャンパスからバスで 4 時間、上高地・大正池に到着すると、迎えてくれたのは 青空に映える上高地の山々。清々しい空気と素晴らしい景色に一同息を飲みました。大正池では、まず古市先生より周辺地域の地形図が 配布され、焼岳を中心に地形の成り立ちについて解説がありました。続いて、尾崎先生から観光客の増加に よる周辺環境への影響について説明を行いました。上高地への観光客は、1985 年頃から急激に増加し、現在も 年間 150 万人程度、そうした観光客が持ち込むゴミや外来種、交通増加による汚染等が問題になっていることが 説明されました。

上高地ビジターセンターまで景色を満喫しながら歩き、昼食をとった後は、小グループに分かれてのトレッキング。

自然公園指導員として活動される地元ボランティアの方々の解説を聞きながら河童橋～明神池を回るコースを 3 時間かけて歩きました。豊富な知識とサービス精神にあふれる指導員の方々より、上高地について、動植物、 地形、歴史、文化など、多様な側面からわかりやすく話をしていただき、時間が足りないほどでした。中には 80 歳 を超える方もいて、その健脚と博識に学生や教員から驚嘆の声が上がりました。美しい上高地について、ただ眺め ているだけではわからない様々な点から理解を深めることができました。（SN）

二日目：

上高地の岳沢麓付近に位置するチャンプ場で、寒さに多少震えながら壮観な朝の北アルプスの景色を 楽しんだ後、松本へ移動して３ヶ所のサイトで実習を行いました。蚕糸記念公園では濱野先生がかつての日本の 絹産業・養蚕業に関する野外講義を行いました。絹産業・養蚕業は 19 世紀終わりから 20 世紀中盤にかけて日本の 有力な産業として栄えた歴史があり、その研究の中心が松本に置かれていました。

松本城へ移動し、日本の４つの天守閣国宝の１つであるこの貴重な歴史的構造物を、松本の NGO「ALSA（Alps Language Service Association）」のボランティアの方々の英語での詳しい説明を受けながら見学し、その建物として の構造、現在に至る歴史などお城にまつわる様々な話を知ることが出来ました。最後の実習地である安曇野は、松本の北に位置し、清らかな湧き水が豊富に出る場所として知られ、その貴重な資源

をわさび栽培に利用している農家を訪問しました。わさび田は土ではなく砂利で覆われ、絶え間なく水が流れるよう絶妙に畝の高さが整えられていました。

この２日間のフィールド実習では、北アルプスという日本を代表する自然、その自然が観光資源として利用されている ことによる自然への影響の実態、また北アルプスの山麓都市での研究活動、観光業、歴史、農業などについて学ぶ 機会になりました。また、今回の実習は FOLENS10 月新入生歓迎の意味もあり、学生間のネットワークは確実に拡がり 強固になったと思われます。

The FOLENS Seminar in October 2011 was a two-day trip to Kamikochi and Matsumoto in Nagano Prefecture. This was a joint program with “Practical Exercise for International Environmental and Agricultural Research”, an official subject of Department of International Environmenta and Agriculturall Research(IEAS).

Day 1: When we finally arrived in Taisho Pond of Kamikochi after a four-hour ride on a bus from Tokyo, the breathtaking beauty of mountains with the blue sky background welcomed us. There, Assoc. Prof. Furuichi of FOLENS delivered a mini-lecture on the geographical features of the surrounding area, with a particular focus on Mt. Yakedake, referring to a topographical map distributed.

Assist. Prof. Ozaki of FOLENS also explained the increase of tourists to Kamikochi and its impacts on the natural environment. Visitors to Kamikochi have rapidly increased since 1985 and currently its number is around 1.5 million per year. This has led to environmental issues such as increased trash, invasion of alien species, and pollution due to increased traffic.

After enjoying a walk and a lunch in the amazing scenery, we departed to three-hour trekking between Kappa Bridge and Myojin Pond. We divided us into small groups, and each group was accompanied by a local nature park guide volunteer. They explained Kamikochi from various aspects such as flora and fauna, geography, history, culture, and so on. Both the students and faculty were so impressed by extensive knowledge, passion, and energy of the guides, some of whom were even over 80 years old.

Thanks to them, we learned various faces of beautiful Kamikochi, not visible when you just pass by.

Day2: After spending cold but glorious morning in the camping site in the foot of the Mt. Hodaka, we moved to Matumoto City, then to Azumino City.

Three stops were made there:
(1) Silk-worm memorial park,
(2) the Matsumoto Castle and
(3) a Wasabi farm.

Dr. Hamano, a retired Professor of the IEAS Department, made a field lecture on the silk warm agriculture/industry in Japan. Silk worm industry used to be an important industry for Japan in the late 19th century

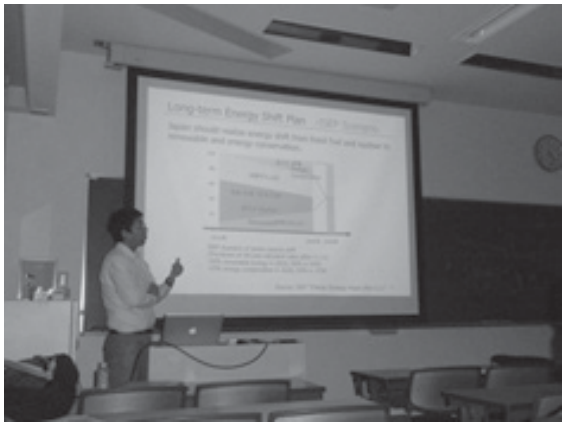
through the middle of 20th century, and Matusmoto was a center of research on silk warm production and silk textile industry. The Matsumoto Castle is one of the four castles designated as the national treasure.

We observed the castle with kind and detailed explanation by international volunteer guides (Alps Language Service Association: ALSA), and could comprehend structure, history, small good stories, etc. of the castle. Azumino, a neighbor city of Matsumoto to the north, is famous for its abundant spring water resource which is recharged in the Northern Japan Alps. Some farmers are making use of the precious resource for Wasabi farming, which requires ample clear water running throughout a year. We visited a Wasabi farm which is opened to the public for observation. The fields for growing Wasabi are covered by pebbles and cobbles, not by soil, and heights of every plantation line in the fields are precisely set for clear spring water to flow steadily.

This 2-day field visit was an opportunity to learn the nature of the Northern Japan Alps, one of the most distinguished natural environments of Japan, and impacts to the precious nature of human activities including sightseeing purposes. Three visits in Matusumoto and Azumino also provided a chance to be familiar with various aspects of a major city in the foot of the Northern Japan Alps. The field visit also had a role of introduction for new FOLENS students and student networks were undoubtedly expanded and affirmed.

（古市剛久・二ノ宮リムさち／Takahisa Furuichi & Sachi Ninomiya-Lim）

テーマ/ Theme	「持続可能なエネルギー戦略」現地訪問事前セミナー～地域からのエネルギーシフト Pre-lecture for the Field Trip “Sustainable Energy Strategies”—Energy Shit from Local Communities
日時/ Date	2011 年 11 月 16 日（水）
場所/ Venue	小金井キャンパス
参加者/ Participants	学生 10 名・教員 6 名 / 10 students & 6 faculty members
プログラム/ Program	· 講義：環境政策エネルギー研究所（ISEP）主任研究員 山下紀明氏 · Q&A · 12 月現場訪問オリエンテーション · ディスカッション：現場訪問から何を学ぶか？ · Lecture by Mr. Noriaki Yamashita, Senior Researcher, Institute for Sustainable Energy Policies · Q&A · Orientation for Field Visit in December · Discussion - What do we want to learn from the visit?



ISEP 山下主任研究員による講義
「地域からのエネルギーシフト」
Lecture “Energy Shift from Communities” by Mr. Noriaki Yamashita, Senior Researcher of Institute for Sustainable Energy Policies (ISEP)

世界、日本、そしてそれぞれの自国のエネルギー事情について考える
Developing thoughts and opinions on energy policies of the world, Japan, and home countries

2011 年度 11～1 月はテーマを「持続可能なエネルギー戦略：エネルギーの地産地消へ向けた地方コミュニティーの挑戦」と定め、11 月に事前講義、12 月に現地訪問、1 月にディスカッションを実施しました。これは、4 月・5 月のセミナーで「今年度学びたい・議論したいテーマ」について参加者全員で話し合った際、「エネルギー」が今年度最大テーマと決定したことにより、計画されたものです。背景には、3 月 11 日に発生した東日本大震災とそれに伴う福島第一原子力発電所の事故によって、エネルギーのあり方を考える・見直す必要性を突き付けられた厳しい現実があります。

今回は実習前の事前講義として、環境政策エネルギー研究所（ISEP）主任研究員の山下紀明氏をお招きしました。ISEP は、政府や産業界から独立した第三者機関として 2000 年に設立され、持続可能なエネルギー政策の実現へ向けた活動を展開する NPO です。原発事故後、エネルギー政策が喫緊の課題として認識される中、メディア等を通じ、確かな理念と実践に根差したメッセージを発し続けています。

講義のタイトルは「地域からのエネルギーシフト」。エネルギー問題を考える際の枠組や、国内外におけるエネルギーの現状、さらに今後のエネルギーシフトの展望について解説していただきました。再生可能エネルギーに関して現在日本はかなり遅れをとっていること、再生可能エネルギーを地域レベルで活用していく取組が今後非常に重要であること、既にいくつかの優れた取組が各地で生まれていること、また、そうした取組が広がるためには強いリーダーシップに加え、市民の参画と多様な関係者の協働、技術や供給側の都合でなく需要にもとづく政策が必要であること等、今後持続可能なアジア・アフリカを各地域から実現していくうえで重要なヒントをたくさんいただきました。参加した学生からは、自然エネルギーの実用化に対する不安や、自国における再生可能エネルギーの活用状況をふりかえる発言などがありました。

The seminars from November to January 2011 focused on a theme of “Sustainable Energy Strategies: Challenges of Local Communities for Local Energy Generation and Consumption”, through a pre-lecture, a field trip, and a follow-up discussion. We, FOLENS students and faculty, decided this year’s main theme should be “energy” after discussing “what we want to learn this year” in the seminars in April and May. This was, obviously, because the Great East Japan Earthquake on the 11th of March and the crisis of the Fukushima Daiichi Nuclear Power Plant that followed made us face the urgent necessity to review and redesign our energy systems and policies.

For the pre-lecture, we invited Mr. Noriaki Yamashita, Senior Researcher of Institute for Sustainable Energy Policies (ISEP). ISEP is an independent, non-profit research organization established in 2000 with a mission to realize sustainable energy policies. As people recognized the review of energy policies as one the most urgent issues after the Fukushima Daiichi Crisis, ISEP has led the discussions in Japan by delivering messages through media and meetings, based on their clear concept and accumulated experiences.

Mr. Yamashita, in his lecture titled “Energy Shift from Communities”, explained the framework of energy issues, the current energy situation in Japan and the world, and the vision of energy shift. What we learned from his informative lecture included: Japan is considerably behind in the international scene of renewable energy development; Community-based generation and consumption of renewable energy is one of the major keys for sustainability; There are already some successful cases in different communities in the world; The success requires not only strong leadership, but also participation of citizens and collaboration of multiple stakeholders, and policies based on the energy demands, but not the needs of the energy supply side or technological development. Overall, the lecture stimulated both students and faculty to develop their thoughts and ideas for realizing sustainable Asia and Africa from communities.

In the Q&A session, one student expressed his doubt about the feasibility of sustainable energy policies, and another questioned the situation of renewable energy utilization in his own country.

Knowledge and questions earned through this lecture have provided a basis for students to further explore the issues and develop their own thoughts and opinions.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	「持続可能なエネルギー戦略：エネルギーの地産地消へ向けた地方コミュニティーの挑戦」長野県飯田・伊那市訪問（第 3 回国際シンポジウムエクスカーション） Sustainable Energy Strategies: Challenges of local communities for local energy generation for local consumption –Visit to Iida and Ina Cities, Nagano Prefecture (The 3rd FOLENS International Symposium Excursion)
日時/ Date	2011 年 12 月 5 日（月）～6(火)　/ December 5 (Mon)–6 (Tue), 2011
場所/ Venue	長野県飯田市・伊那市 / Iida & Ina City, Nagano Prefecture
参加者/ Participants	学生 21 名・教員 5 名・海外拠点教員 5 名・ゲスト 1 名 / 21 students, 5 TUAT faculty members, 6 E&R Base faculty members & 1 guest
プログラム/ Program	12 月 5 日（月） 7:15 府中キャンパス集合 バス出発 オリエンテーション：二ノ宮リムさち（環境リーダー育成センター） 一言自己紹介「この実習で学びたいこと」：全員 バス内レクチャー＆プレゼンテーション ①持続可能な都市としての飯田とその市民力形成：降旗信一（農学研究院　准教授） ②エネルギーとは何か：下ヶ橋雅樹（環境リーダー育成センター） ③バイオマスの活用：宮崎雄矢（FOLENS 学生） ④ヒートポンプとは何か：趙龍（FOLENS 学生） 11:30 長野県飯田市到着 昼食（Natural Kitchen TESSHIN） 13:00 おひさま進歩エネルギー株式会社（地域におけるエネルギーシフトを市民・行政等との協働で推進） 原 亮弘社長による講義 14:30 質疑応答 15:00 おひさま進歩エネルギーにおける省エネの取組を見学 15:30 移動 16:00 さくらファーム見学（きのこ培地再利用ボイラー） 17:30 三宜亭本館（旅館）見学（排湯利用ヒートポンプ、廃材等利用ボイラー） 19:00 夕食～宿泊 12 月 6 日（火） 朝食・チェックアウト（各自） 8:30　ロビー集合 9:00　飯田市立鼎みつば保育園見学（公的施設へのソーラーパネル設置） 10:00 南信バイオマス共同組合見学（地元企業 5 社の共同組合による間伐材を利用した木質ペレットの製造・普及）　井口潤子氏 11:00 移動 12:00 長野県伊那市到着 昼食（道の駅南アルプスむら「野のもの」） 13:30 伊那谷自然エネルギー研究会・長谷中山集落発電所見学（市民グループによるマイクロ水力発電）小澤陽一氏 14:30 三峰川電力発電所見学（企業による小水力発電） 16:00 出発 19:00 農工大府中キャンパス到着 Monday, 5 December 2011 7:15 Meet at TUAT Fuchu Campus Depart by bus Orientation & ice-breaking activities –Assis. Prof. Sachi Ninomiya-Lim Lectures and presentations on bus: - Background of Iida as a sustainable city - power of citizens –Assoc.

	Prof. Shinichi Furihata, TUAT - Basic of Energy –Assoc. Prof. Masaki Sagehashi, FOLENS - Biomass Utilization – Yuya Miyazaki, FOLENS student - What is a heat pump? – Zhao Long, FOLENS student 11:30 Arrive in Iida City, Nagano Prefecture Lunch (Natural Kitchen TESSHIN) 13:00 Arrive in Ohisama Shinpo Energy Corporation (a local business successfully promoting energy shifts in partnership with communities and government) Lecture by Mr. Akihiro Hara, President 14:30 Q&A 15:00 Learn energy saving practices at Ohisama Shinpo Energy Co. 16:00 Visit Sakura Farm (Utilization of mushroom bed wastes for heat generation for the farm) 17:30 Arrive in Sangitei Hotel (Utilization of overflowed hot spring water for a heat pump and wood wastes for heat generation) 19:00 Dinner – Enjoy Japanese hot spring and traditional hotel! Tuesday, 6 December 2011 Breakfast/ Check out Individually 8:30 Meet at Hotel Lounge 9:00 Visit Kanae Mitsuba Nursery (Solar panels installed at a public facility) 10:00 Visit Nanshin Biomass Cooperative (Cooperative of local businesses promoting wood pellets utilizing thinned woods as an alternative energy source) 12:00 Arrive in Ina City, Nagano Prefecture Lunch (Michinoeki Minami Alps Mura: Nonomono) 13:30 Visit Hasenakayama Community Micro Hydro Power Station, Inadani Natural Energy Study Group (Micro hydro power generating system owned and managed by a local community group) 14:30 Visit Mibugawa Small-Scale Hydro Power Station (Small-scale hydro power generating facilities) 16:00 Depart 19:00 Arrive in TUAT Fuchu Campus

Natural Kitchen TESSHIN で地元飯田の野菜をつかった美味しい昼食
Delicious lunch of locally produced vegetables at Natural Kitchen TESSHIN

おひさま進歩エネルギー株式会社　原亮弘社長による「地域からはじめよう！！エネルギーシフト」と題された講義
Lecture “Change our energy, now!” by President Akihiro Hara of Ohisama Shinpo Energy

きのこ培地（廃菌床）を再利用するボイラー（さくらファーム）
Boiler reusing mushroom bed wastes (Sakura Farm)

温泉の排湯を利用したヒートポンプ（三宜亭本館）
Heat pump facility utilizing overflowed hot spring (Sangitei Honkan Hotel)

規制の壁を乗り越え保育園の屋根に設置されたソーラーパネルの前で（飯田市立鼎みつば保育園）
In front of solar panels installed at a nursery rooftop overcoming difficulties set by conventional regulations (Kanae Mitsuba Nursery)

先生方の環境意識向上やこどもたちへの環境教育等について園長先生より解説（飯田市立鼎みつば保育園）
Talk by Principal about teachers' environmental awareness development and environmental education to children (Kanae Mitsuba Nersury)

間伐材を利用した木質ペレットの製造・普及木質（南信バイオマス共同組合・南信チップセンター）
Promotion of wood pellets utilizing thinned woods as an alternative energy source (Nanshin Biomass Cooperative/ Nanshin Chip Center)

市民グループによるマイクロ水力発電実証実験（伊那谷自然エネルギー研究会・長谷中山集落発電所）
Micro hydro power generation equipment installed by a local group (Inadani Natural Energy Study Group/ Hasenakayama Community Power Station)

事業として実用化されている小水力発電（三峰川電力株式会社　第四発電所）
Small-scale hydro power station feasibly operated by a private company (Mibugawa Power Company, No.4 Power Station)

「エネルギーの地産地消」へ向けた地域の取組について学ぶことを目的に、長野県飯田市・伊那市を訪問しました。このセミナーは、FOLENS 第 3 回国際シンポジウムのエクスカーションとしても位置付けられ、海外教育・研究拠点大学や協力大学の教員（ガーナ大学 John Ofosu-Anim 先生、ベトナム・カントー大学 Le Viet Dung 先生、中国環境科学研究院 Hou Hong 先生、タイ・カセサート大学 Tiwa Pakoktom 先生、ガーナ・クワメンクルマ科学技術大学 Samuel Nii Odai 先生）や、パネリストとして登壇いただいた「人と農・自然をつなぐ会」の杵塚歩氏にもご参加いただきました。

実習は、4・5 月のセミナーで、3 月 11 日の東日本大震災とそれに伴う東京電力福島第一原子力発電所事故の衝撃のなか、今年のセミナーでとりあげるべきテーマを話し合った際、「エネルギー」に最も高い関心が集まったことから計画されました。今後のエネルギー戦略の上で大きな鍵となる「地産地消」へ向けた取組を進める地域を訪問し、人々の話を聞き、再生可能エネルギーの導入実践を見学して、その思想や戦略、技術と制度等、様々な観点から、その可能性と課題を考えることを目指しました。

1日目：

バスの中、まず初めに、多様な専攻・出身国から集まる学生や教員の全員が「今回の実習で学びたいこと」を発表。「自国にない実践を見たい」「人々の中にあるパワーについて学びたい」「バイオマスについて知りたい」「地域の中でエネルギーをまわす方法について学び、自国で適用可能か考えたい」「補助金なしでは成り立たないイメージのある自然エネルギーが、本当に実用可能なのか知りたい」といった声が聞かれました。続くバス内ミニレクチャーでは、まず特別ゲストの降旗先生より、公民館活動を中心とした社会教育が盛んなことで知られる飯田市の背景について解説がありました。「環境文化都市」づくりに積極的に取り組む飯田市。この土台には、社会教育を通じた市民力の形成があります。また、FOLENS 下ヶ橋先生からはエネルギーの基本に関して、さらに FOLENS 学生の宮崎さんより、再生可能エネルギーとして注目されるバイオマスについて、趙さんより、省エネルギー技術ヒートポンプについて、説明がありました。

飯田に到着し、初めの訪問先は、地域のエネルギーシフトを市民・行政等との協働で推進する「おひさま進歩エネルギー」。代表取締役 原亮弘氏による講義は、「地域からはじめよう！エネルギーシフト～市民の意志あるお金で取り組む自然エネルギーの普及促進」と題され、市民ファンドを用いた革新的な仕組みやそこに至る道筋と成果についてわかりやすくご説明いただき、また地域や社会全体の未来を見据えての展望を「望む未来を選びとる」ことの重要性とともにお伝えいただきました。市民ファンドとは、一般の人々から出資を募り、それを元手にソーラーパネル等の発電・省エネ設備を設置することで使用者による初期費用の負担をなくし、資金はそこで発電した電力使用への課金で回収するという仕組みです。講義の後は、ソーラー技術、売電の仕組み、市民ファンドの広報や普及、補助金なしでの事業実施の可能性、原社長ご自身の社会教育活動について等、様々な質問が、予定時刻を過ぎても次々と続きました。その後、事務所内に取り入れられた省エネ技術を見学しました。

続いて、おひさま進歩エネルギー谷口氏・インターンの清川氏・古山氏に同行いただき、同社の事業による自然エネルギー・省エネルギー化の現場を訪問しました。まず、きのこを栽培する（有）さくらファームで、従来の石油に代わり培地（廃菌床）を燃料として再利用するボイラーを見学。導入を決断した桜井社長より、その思いと成果、苦労や課題をお伺いしました。さらに、温泉旅館の三宜亭本館では、温泉排湯を利用したヒートポンプと廃材を燃料とするボイラーについて、児島社長に解説していただきました。その夜はここに宿泊し、留学生にとっては日本の温泉旅館を体験する絶好の機会となりました。

2日目：

翌朝、再び谷口氏・清川氏・古山氏に同行いただいて、飯田市立鼎みつば保育園を訪問。飯田市では、公的施設の屋根に民間企業（おひさま進歩エネルギー）がソーラーパネルを設置し売買電契約を結ぶという取組が、市行政の柔軟な対応により実現しています。園長先生からは、市の「環境文化都市」へ向けた取組の中での園職員の意識改革や、パネル設置後のこどもたちへの環境教育、そしてその家族の意識の高まりについてもお伺いしました。

この後は、おひさま進歩エネルギーによる事業からは離れ、まず同じ飯田市内で、間伐材を利用する木質ペレットの製造・普及に取り組む地元企業 5 社が設立した南信バイオマス共同組合を訪問しました。理事長の南信チップセンター井口肇社長より、実際のペレット製造現場を見せていただきながら、山や自然環境に

対する思いと、ペレット製造販売事業化へ向けたご苦労と成果、今後の展望についてお伺いすることができました。留学生らからは、森林の所有権・伐採権や植林等の森林管理方法に関する質問があり、間伐材活用による林業の活性化と森林の健全化が求められる日本と、森林の過伐採による荒廃が問題となっている地域との状況の違いも浮かび上がりました。

午後からは伊那市に移動し、まず、伊那谷自然エネルギー研究会がマイクロ水力発電設備の実証実験を行っている長谷中山集落発電所を訪問しました。地元で燃料会社を経営しながら活動される研究会の小澤陽一氏より、設置の背景や目的、設備の詳細をご説明いただき、さらに水路の清掃等日々の管理を担う長谷支所長の中山昌計氏より、管理方法等について実演いただきました。設備はベトナムから輸入されたもので、東南アジアの山岳部では同様の水力発電設備が広く活用されているという留学生や海外拠点教員の話を、日本人学生らは興味深く聞いていました。

実習最後の訪問地は、三峰川電力株式会社の小水力発電施設である第四発電所です。当日は年に一度の点検中で機器は停止していましたが、兼子課長より設備や事業の概要を解説していただき、実際に機器を間近に見せていただきました。私企業による収益事業として既に実用化されている小水力発電ということで、今後こうした事業が普及していくだろうという展望に、発電設備の開発需要が今後続くであろうアジア・アフリカ地域の留学生や教員も、高い関心を持った様子でした。

バスに乗り込み、全員が順番に「今回の実習で学んだこと、印象に残ったこと」を一言。「自分の専門分野とは全く異なる新しい知識を得た」「多様なアイディアと技術について学んだ」というエネルギーに関する知識や技術面での学び、「行政と住民の意識の高さが印象的」「必要な知識が、技術者だけではなく地域の人々にも共有されていることがすばらしい」「地域の人々の責任感、やる気に感銘を受けた、政府ではなく私たちが変化を起こさなければならない」という地域の力への気づき、「自分の故郷にはほとんど電力がない、日本にはこれだけの自然資源があって幸運だ」「自然エネルギーを自国でどう活用できるか考えたい」「自国の政策決定者にこうした事例について紹介したい」「自分の故郷について改めて考える機会となった」という自国との比較や自国・出身地域での適用についての考え等が聞かれました。

全体を通じて、エネルギー問題、そして社会のあらゆる問題に対する取組には、技術やお金ばかりではなく、地域の力、リーダーの力、「とにかくやってみよう」という意志や情熱と実際に事業を進める知恵と協力が必要だということ、またそれがあれば誰もが、地域から、草の根から、大きな事を成し遂げられるということを、学ばせていただいたと感じています。

なお、訪問先の決定については、11 月の事前セミナーで講義をしてくださった環境政策エネルギー研究所（ISEP）主任研究員の山下紀明氏より、大変貴重なアドバイスをいただきました。

The FOLENS Seminar in December 2011 was a field trip to Iida and Ina Cities of Nagano Prefecture with an objective to learn about challenges of local communities for the local generation of energy for the local consumption. This was also organized as an excursion for the 3rd International Symposium of FOLENS held on 2-3 December, thus,

professors of the E&R Bases and a partner university (Dr. John Ofosu-Anim of University of Ghana, Dr. Le Viet Dung of Can Tho University of Vietnam, Dr. Hou Hong of Chinese Research Academy of Environmental Sciences, Dr. Tiwa Pakoktom of Kasetsart University of Thailand, and Dr. Samuel Nii Odai of Kwame Nkrumah University of Science and Technology, Ghana), a panelist (Ms. Ayumi Kinezuka of Hitoto Shizenwo Tsunagukai) also participated.

The trip forms the core part of a seminar series from November to January on the theme "Sustainable Energy Strategies: Challenges of Local Communities for Local Energy Generation and Consumption". In the discussions in FOLENS Seminars in April and May, held in the middle of confusion and shock after the Great East Japan Earthquake and Fukushima Daiichi Nuclear Power Plant Disaster, we decided to set "energy" as the main topic of our learning this year. For this trip, we particularly focused on "the local generation for local consumption" or *CHISAN CHISHO*, a key concept in sustainable energy policies. The trip was planned for us to visit communities that make challenges, listen to stories of the people there, observe actual practices of renewable energy utilization, and learn about philosophies, strategies, and technological/ institutional possibilities and issues for local-scale sustainable energy generation.

Day 1:

In the bus, as an opening activity for the two-day trip, all the students and faculty who gathered from various research areas and countries expressed "what I expect to learn from this trip". Topics raised included "practices that I cannot find in my country", "the power inside the people", "biomass", "ways of using energy in a local community and how that model can be applied to my country", and "how sustainable energy policies can be realized without governmental subsidies".

Next, a series of mini-lectures followed. Assoc. Prof. Furihata of TUAT, a special guest, introduced the background of Iida City, which is widely known for its people's active learning practices utilizing Community Learning Centers or KOMINKAN. It showed that the efforts of Iida City to create a "sustainable cultural city" are supported by its empowerment process of its residents over time. Assoc. Prof. Sagehashi of FOLENS talked about the basic of energy, and FOLENS students, Mr. Yuya Miyazaki and Mr. Zhao Long respectively explained about biomass, one of the important renewable energy sources, and a heat pump, one of the energy-saving technologies.

The first destination in Iida was "Ohisama Shinpo Energy", which promotes energy shift from communities in collaboration with local people and government. President Akihiro Hara gave a lecture titled "Natural energy use promotion intentionally funded by citizens –Change our energy, now!", with explanation about their innovative "Citizen Fund" system, how they have come to realize it and how successful it has been. The "Citizen Fund" is a scheme to gather investments from people to finance the initial costs to install renewable-energy-generation or energy-saving equipments such as solar panels. The investments are to be returned with interests after collecting fees for electricity produced with these equipments from the users. President Hara also talked about the future vision, introducing the company's ultimate goal to "decide and realize our desirable future". After the lecture, both faculty and students were desperate to ask questions from various aspects, such as solar technologies, a scheme to sell electricity, PR and extension of Citizen Fund, possibility of sustainable energy business without governmental subsidies,

President's own experience in community learning activities, and more. After a prolonged Q&A session, we also observed energy-saving appliances installed in their office.

Mr. Taniguchi, staff, and Mr. Kiyokawa and Mr. Koyama, interns of Ohisama Shimpo Energy, accompanied us to visit some of their installment sites. The first was Sakura Farm, a mushroom producing farm, which has introduced a boiler to utilize mushroom bed wastes instead of oil as a resource. President Toshimi Sakurai told us his motivation, achievements, difficulties, and issues. The next site was Sangitei Honkan, a spa hotel. President Kojima introduced their heat pump utilizing overflowed hot spring water and a boiler using wood wastes. This hotel was also our accommodation for the night, and provided international participants an opportunity to experience Japanese-style rooms and a hot spring public bath.

Day 2:

The second day started with a visit to Kanae Mitsuba Nursery, accompanied by Mr. Taniguchi, Mr. Kiyokawa, and Mr. Koyama again. Here, Ohisama Shimpo Energy installed solar panels on its rooftop and receives electricity fees from the nursery. Usually in Japan, implementation of such a scheme is difficult if not impossible, due to rigid regulations. However, flexible support of Iida City enabled such a path-breaking challenge. Principal of the nursery also explained about the awareness development of its staff under the City's initiatives for creating an "Environmental Cultural City" and environmental education to the children and their family after the solar panel installment.

After these Ohisama Shinpo Energy sites, the next destination was Nanshin Biomass Cooperative established by five local companies to promote wood pellet production and consumption. Its Director, Mr. Hajime Iguchi, President of Nanshin Chip Center, showed us his pellet factory, while telling us his passion for mountains and nature, hardships and achievements he has had with the wood pellet business, and the vision for the future. Students, particularly those from outside of Japan, questioned about land ownership, logging rights, and forest management practices in Japan. The differences became apparent between Japan where thinning of woods has been an urgent task to revitalize the forestry and the forest environment, and areas where deforestation due to over-logging has been the major problem.

In the afternoon, we moved to Ina City, and first visited Hasenakayama Community Power Station where Inadani Natural Energy Study Group installed a micro hydro power system as an experiment. Mr. Yoichi Ozawa, who leads local activities for sustainable energy promotion while running a local fuel shop, explained the backgrounds and objectives of the station and details of the equipment. Director of Ina City Hase Branch, Mr. Shokei Nakayama, showed how he cleans the equipment and waterway everyday for the smooth operation. Students from Vietnam were amazed to know the equipment was imported from their home country. Japanese students were learning with interest from some of the faculty and students telling that similar equipments are often installed in mountainous areas of Southeast Asia.

The last destination was a much larger, but still small-scale hydro power station, the No. 4 Power Station of Mibugawa Power Company. It was under annual inspection and all the machineries were stopped, but Mr. Kaneko, a company staff, explained how it works letting us closely look at the equipments. By learning about an example of

small-scale hydro power generation that is feasible as a profit creating business, we could understand the great possibility of small-scale hydro power stations as alternatives in sustainable energy policies. Apparently, this also attracted interests of faculty and students of Asian and African regions where demand for the development of power stations is increasing.

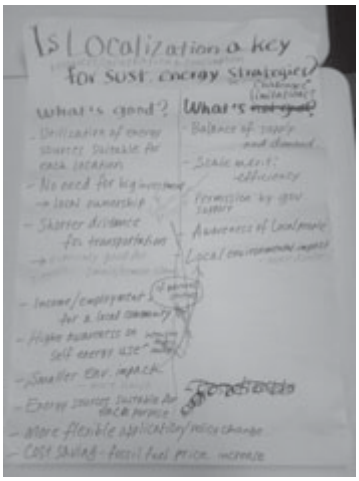
On the bus, all the participants expressed “what I learned or what I was impressed during this trip”. The comments included those that focused on knowledge and technologies of energy such as; “I have acquired knowledge different from my own specialties”; and “I learned various ideas and technologies for sustainable energy”. Others focused on power of local communities saying that they were impressed by; “the commitments of local people - they tell us that not government but we have to act to make change”; “the fact that knowledge is not only owned by technicians or specialists but also local people”, and “the high level of awareness of both government and local people”. Some also commented reflecting on situations in their home country/community, saying “I would like to think about how to apply renewable energy utilization in a home country”; “I want to talk about what I learned to policy makers in my home country”; “While there is almost no electricity in my home community, people in Japan are lucky to have various natural power resources”; and “This gave me an opportunity to think again about my home community”.

Overall, we learned that for solving energy issues, or any other issues in our society, we need not only technologies and money but also power of communities and power of leaders, with intension and passion to act, and wisdom and cooperation to actually operate a project. And more importantly, with these, anyone, from a local community, or a grass-root level, can create the future and change the world.

Last but not least, we greatly appreciate valuable advice from Mr. Noriaki Yamashita, Senior Researcher of Institute for Sustainable Energy Policies (ISEP), which enabled us to plan this trip as a meaningful learning opportunity.

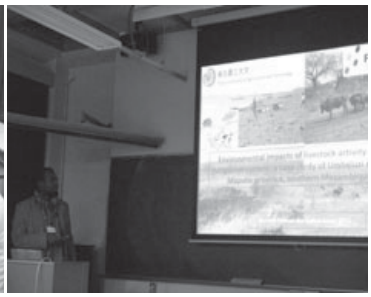
（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	「持続可能なエネルギー戦略」現地訪問事後セミナー～ふりかえり・関f連研究発表・ディスカッション Sustainable Energy Strategies – Follow-up for Iida/Ina Field Trip: Reflection, Presentation, and Discussion
日時/ Date	2012 年 1 月 11 日（水）/ Wednesday, 11 January, 2012
場所/ Venue	府中キャンパス / Fuchu Campus
参加者/ Participants	学生 6 名、教員 3 名　/ 6 students & 3 faculty staff
プログラム/ Program	1) 12 月現地訪問のふりかえり（スライド） 2)自身の研究とエネルギー問題の関連について学生発表 3)グループディスカッション：「ローカライゼーション（エネルギーの地産地消）は持続可能なエネルギー戦略へのカギか？」 4) ミニ新年会！ 1) Reflection on the field trip in Dec (slides) 2) Presentation by students whose research field is directly related to energy issues 3) Group discussion – Is Localization a Key to Sustainable Energy Strategies? 4) Mini New Year Party!



「ローカライゼーションは持続可能なエネルギー戦略へのカギか？」をテーマに利点・課題を書き出した
"Is localization a key for sustainable energy strategies?" – Advantages and Challenges

FOLENS 新年会を兼ねたディスカッションタイム
Discussion with drinks and snacks – New-year party!



学生自身の研究とエネルギーとの関連について発表
Presentation by students on relationship between their research and energy issues

2012 年が明けて初めての FOLENS セミナーは、前回、「エネルギーの地産地消へ向けた地方コミュニティーの挑戦」をテーマに実施した長野県飯田・伊那市訪問の事後セミナーとして行いました。参加学生は少数でしたが、密度の濃い話し合いが持たれました。

飯田・伊那市訪問の内容をスライドでふりかえり、参加しなかった学生と経験を共有した後、各学生より、自身の研究テーマとエネルギーとの関連について、発表がありました。環境資源物質科学専攻の周東さんからは、日本の森林問題と、間伐材等をバイオマス資源として活用することの意味や可能性について報告されました。次に、国際環境農学専攻の Antonio さんからは、自国モザンビーク南部で放牧による土壌や植生への影響に関する事例研究に取り組んでいることが報告され、野焼きの問題を解決する手段として植物のバイオマス資源活用が考えられること、また家畜の糞尿をエネルギー源として活用するアイディアについて説明

がありました。また、同じく国際環境農学専攻の Win Win さんからは、地熱ヒートポンプの利用により発生する熱が土壌へどのような影響を与えるか、自身の研究で取り組んでいる調査について紹介がありました。それぞれの発表には、学生教員双方から活発な質問が出されましたが、やり取りの中で、エネルギー問題を考えるためには様々な視点や研究的取組が必要であること、それぞれの研究はエネルギー問題という大きな枠組みでとらえるとほんの一部に過ぎず、常に多様な研究領域や現場での動きに関心をもって取り組んでいくことが重要であることが確認できたことは、特に有意義であったかと思います。

最後に、FOLENS 新年会も兼ねて皆でお茶とお菓子を囲みつつ、ディスカッション。「ローカライゼーション（エネルギーの地産地消）は持続可能なエネルギー戦略へのカギか？」をテーマに、利点・難点を出し合いました。利点として、「各地域や用途に適したエネルギー源を活用できる」「多額の投資を必要としない～地域で所有できる」「輸送の無駄が省ける」「地域社会の雇用・収入を創出できる」「自分たちのエネルギー使用への意識が高まる」「環境負荷が小さい」「柔軟な運用や方針転換が可能」といった点が挙げられ、また難点や課題として「需要供給のバランスがとれるかどうか」「小規模ゆえの非効率性」「政府・法の規制」「地域住民の意識向上が必要」「場合よっては環境負荷が集中的に起こることもあり得る」といった点が出されました。少人数で短時間ながら、こうした論点が次々と挙がったのは、11 月からの連続セミナーを通じて、エネルギーの地産地消に関する意識や考えが深まり広がった成果だと思われました。ここからはそれぞれが、多様な視点と共通の関心を大切にしながら、エネルギーの方向性について考え、行動していかねばならないことを確認しました。

The first FOLENS seminar in 2012 was a follow-up for the field trip to Iida and Ina in December. Unfortunately only six students participated, but being a small group we could have active and substantial discussion.

First, we went through slides to reflect on our December trip titled “Sustainable energy strategies: Challenges of local communities for local energy generation for local consumption”. This also let those students who did not attend the trip follow and understand the experiences.

After that, three students presented how their research topics relate to energy issues. Naotaka from Department of Natural Resources and Eco-materials reported the problems Japanese forest and forestry are facing and the possible utilization of forest materials as domestic biomass energy resources. Antonio, from Department of International Environmental and Agricultural Science, introduced his case study of environmental impacts on soil and vegetation caused by livestock in Southern Mozambique. He explained his ideas to utilize grasses as a biomass energy resource as a solution to the problems of grassland burning in the area, and also to utilize livestock manure for creating energy. Win Win, also from Department of International Environmental and Agricultural Science, presented her research of impacts caused by thermal effects of ground source heat pumps on soil properties. Each presentation was followed by an active Q&A session. Through discussions, we could recognize two important points: 1) For understanding and tackling energy issues, a variety of view points and research activities are necessary; and 2) Each research focus forms actually just a small portion of a large framework of energy issues, therefore it is important for us to keep connecting with various other researches and initiatives in a society.

Finally, we enjoyed a discussion and a small new-year party with drinks and snacks. Under the theme, “Is Localization a Key for Sustainable Energy Strategies?”, we listed advantages and disadvantages of localization of energy generation and consumption. Advantages included “Suitable energy sources for each location/ purpose”, “No need for good investment – local ownership”, “Shorter distance of transportation”, “Income/employment for a local community”, “Higher awareness of people on own use of energy”, “Small environmental impact”, and “Flexible application and policy change”. Disadvantages, or challenges and limitations, included “Balance of supply and demand”, “Inefficiency due to a small scale”, “Government regulation and restriction”, “Awareness and understanding of local people”, and “Local environmental impact”.

A small group of students could come up with such a comprehensive list in a short discussion, this can probably be seen as a successful outcome of their learning thorough a series of seminars from November. We recognized that we now all need to show how each of us can think and act for sustainable energy strategies, with various view points and common interests.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	災害教育への導入～東北震災・津波被災地訪問とボランティア活動 Introduction to Disaster Education – Field Visits and Volunteer Activities in the Afflicted Areas of the Tohoku Earthquake and Tsunami
日時/ Date	2012 年 3 月 7 日（水）～9(金) / 7 (Wed) – 9 (Fri) March, 2012
場所/ Venue	宮城県/ Miyagi Prefecture
参加者/ Participants	学生 6 名・教員 2 名 / 6 students & 2 faculty members
プログラム/ Program	1 日目（3 月 7 日（水）） 09:30 仙台駅集合・自己紹介・実習概観（二ノ宮・浦田（RQ 災害教育センター）） 10:00 仙台駅出発 10:30 東松島～女川～雄勝～志津川：被災地状況（浦田・古市） 14:30 南三陸復興ダコの会：阿部氏（入谷公民館　館長） 15:45 入浴 16:30 志津川 17:15 登米 RQ オフィス～宿舎チェックイン 18:30 夕食準備・夕食 20:00 一日のふりかえり（二ノ宮・古市） 2 日目（3 月 8 日（木）） 07:00 起床・朝食＆昼食準備 08:00 朝食 宿舎出発 気仙沼市地福寺：ボランティア活動①境内整備作業（片山秀光和尚・RQ 小泉ボランティアセンター西村氏） 15:00 出発 16:00 買物 18:00 入浴・夕食 Day 3 (3 月 9 日（金）) 05:30 起床・朝食準備・朝食 07:00 宿舎出発 08:45 気仙沼市唐桑地区：ボランティア活動②牡蠣養殖作業手伝（畠山政則氏・RQ 唐桑センター星野氏） 15:00 出発 16:30 宿舎着・ふりかえり（二ノ宮・古市） Meeting 5: Wrap-up discussion of this seminar (Ninomiya/Furuichi) 18:00 宿舎出発・帰京 Day 1 (Wednesday, March 7) 09:30 Meet at the east gate of the Sendai station Meeting 1: Self-introduction and overview of this field seminar (Ninomiya/Urata, RQ-Disaster Education Center) 10:00 Leave the Sendai station by a wagon (TOYOTA HI-ACE) 10:30 Higashi-Matushima – Onagawa – Ogatsu – Shizugawa: Landscape of the damage (Urata/Furuichi) 14:30 Minamisanriku Fukko Dako no Kai (Minamisanriku Restoration Octopus Association): Mr. Abe, Iriya Community Center 15:45 Bathing 16:30 Leave Shizugawa 17:15 Tome RQ Office – Check in to the accommodation 18:30 Cooking for dinner (Curry and rice, salad, etc.) 19:00 Dinner 20:00 Meeting 2: Wrap-up discussion of the day (Ninomiya/Furuichi) Day 2 (Thursday, March 8) 07:00 Wake-up, Preparation of breakfast and lunch

	08:00 Breakfast Leave the accommodation Arrive at Jifuku-ji Temple, Kesen-numa city Volunteer activity 1: Cleaning up a tsunami stricken temple (Mr. Nishimura, RQ-Koizumi Volunteer Center) 15:00 Leave Motoyoshi 16:00 Shopping at Michinoeki of Tome (Foods) 16:30 Shopping at a DIY shop (Equipment) 18:00 Bathing 19:30 Cooking 20:00 Dinner/ Preparation for Tomorrow Day 3 (Friday, March 9) 05:30 Wake-up, Preparation of breakfast 06:00 Breakfast 07:00 Leave the accommodation 08:45 Arrive at Karakuwa area, Kesen-numa city Volunteer activity 2: Oyster farming (Hoshino, RQ-Karakuwa Center) 15:00 Leave Karakuwa 16:30 Arrive at the accommodation/ Cleaning Meeting 5: Wrap-up discussion of this seminar (Ninomiya/Furuichi) 18:00 Leave the accommodation 20:00 Ichinoseki Station- Dismissal

津波による破壊の痕跡がそのまま残る住宅街に衝撃を受ける（東松島）
Shaken while walking among destroyed houses still left as they were after a year (Higashimatsushima)

多くの檀家を失った寺の境内で鎮魂行事に備え砂利を敷く作業（気仙沼・地福寺）
Graveling a garden of a temple to prepare for its memorial event: the community lost hundreds of lives in the Tsunami (Jifukuji Temple, Kesennuma)

RQ 市民災害救援センター（現在は RQ 災害教育センターほかに発展）の３．１１からこれまでについて話を伺う（RQ 登米復興交流センター）
Learning how RQ-CNJ has helped the communities after 11 March until now (RQ Tome)

津波で壊滅した牡蠣養殖の復興支援～稚貝がついたホタテの殻を縄でつなぐ作業（気仙沼・唐桑）
Helping to rebuild oyster farming – tying scallop shells, nests of

美しく豊かな湾を漁船で案内していただきながら津波被害とその後のお話を伺う（気仙沼・唐桑）
Cruising around beautiful and productive bay while listening to

活動を温かく受入れもてなしてくださった奥様とともに記念撮影（気仙沼・唐桑）
Posing with Mrs. Hatakeyama who warmly received our visit with a great hospitality

oysters (Karakuwa Area, Kesennuma)

what has happened on and after 11 March 2011 (Karakuwa Area, Kesennuma)

(Karakuwa Area, Kesennuma)

2012年度最後のFOLENSセミナーは、2011年3月11日の東日本大震災による津波で甚大な被害を受けた訪問し、ボランティア活動に取組みつつ、被災地とそこに生きる方々から学ばせていただくことを目的として実施しました。今後の継続的な活動を視野に入れた試行的取組と位置付け、参加者は6名の学生と2名の教員。現地コーディネートを、震災直後からの精力的な被災者救援活動の経験をベースに、災害から学ぶ「災害教育」の推進を目指す「RQ災害教育センター」にお願いし、東北本部の浦田紗智さんに全行程に同行いただきました。

1日目：

宮城県仙台市からマイクロバスに乗り、RQ災害教育センター・浦田さんに案内いただきながら、沿岸地域を北上しました。

初めに車を停めた東松島市では、津波により破壊された状況そのままの住宅地の様子に、被害の甚大さと恐ろしさ、日常が消失する悲しさ、そして復興の道のりの困難さに、一同、衝撃を受け、無言となりました。そこから、女川町、石巻市、南三陸町とリアス式海岸沿いに走ると、漁村と漁港の破壊の跡が次々と現れます。美しい景色と被害の悲惨さを胸に刻みながら、被災地域や人々の状況や地殻変動による沿岸部の沈降等について、浦田さんや教員の情報提供をもとに話しつつ、南三陸町入谷地区にある「南三陸復興ダコの会」の工房に到着しました。工房では、入谷公民館長の阿部氏や作業をされている方々にお話を伺いながら、復興のシンボルとなっている「オクトパス君」グッズや地元の伝統文化に根差したまゆ玉グッズなどの手工芸品を製作、販売している様子を見せていただきました。また、地区の神社にオクトパス君が祭られた様子も拝見しました。

その後、志津川地区の復興市場で食材を買い、被災直後から避難所やボランティアの拠点として活用され復興の拠点となっているホテル観洋ですばらしい温泉を堪能し、宿泊先となるRQ登米復興交流センターへ移動、食事をとりながら各自の参加動機（自国での災害に備えて日本の経験から学びたい、被災した方々の役に立ちたい、震災当時自国のニュースで見ていた状況を現地で直に知りたい、災害から1年経った現状を自分の目で見たい）を述べ合って、寝袋で就寝しました。

2日目：

いよいよ参加学生が心待ちにしていたボランティア活動初日。全員で昼食用のおにぎりをにぎって（初挑戦の留学生も健闘！）、作業着になり、準備万端。気仙沼市の地福寺へおじゃましました。

地福寺は少し高台にありますが、今回の津波で天井間際まで浸水し、3年前に完成したばかりの本堂は枠組がかろうじて残ったとのこと。そこから見渡すことのできる沿岸地域はほとんど何もない更地になっており、震災以前は境内から海が見えなかったというお話が信じられません。檀家の方々も多くが命を落とされ、寺では震災後1年を契機とした鎮魂の行事を準備しているところでした。我々は、その準備のために、境内に砂利を敷くという作業をお手伝いしました。被災した方々自らが復興のために働く「気仙沼復興協会」の方々もいらしており、作業の合間に様々なお話を伺うことができました。地福寺住職の片山秀光和尚より、

「めげない　にげない　くじけない」とご自身で書かれた記念の軸と、留学生には CD までいただき、一同、ありがたく一日を終えました。

宿泊先へ戻り夕食の後、浦田さんより、RQ 災害教育センターの前身団体である「RQ 市民災害救援センター」による震災直後からの被災者救援の取組について話していただきました。センターは、ボランティアのネットワーク組織であり常勤・有給のスタッフがいて指示系統のある通常の組織とは異なること、被災者支援に関わりたい多くの個人が自己責任、自己判断で参画し、行政の手の届かない被災者ニーズに柔軟に応えてきたこと、また、浦田さんご自身の活動に参加した経緯や現在の心境などに、学生も教員も強く感銘を受けていました。

3 日目：

最終日は、気仙沼市唐桑地区で牡蠣養殖業を営む畠山政則さんご夫妻に受け入れていただき、牡蠣養殖の復興を支援するため、牡蠣の稚貝がついたホタテの殻を縄でつなぐ作業をお手伝いしました。RQ 唐桑拠点の星野さんにコーディネートいただき、他のボランティアの方々と合流しての作業となりました。

慣れない手つきの我々を、明るく優しい奥さまに丁寧にご指導いただきました。また、ご主人には漁船を出して湾内を案内していただき、美しく豊かな唐桑の自然と、震災時・後の状況、今後の牡蠣養殖の展望等、様々なお話をお伺いしました。作業の合い間には、津波に流されず残された貴重な牡蠣を焼いていただいたり、新鮮な生ホタテをいただいたり、さらに牡蠣汁やお刺身など大変豪華な昼食もいただいて、貢献を大きく上回るおもてなしをいただいてしまいました。畠山さんのお宅には、これまで訪れたボランティアの寄せ書きがたくさん残されており、我々も、いただいたカレンダーの裏にそれぞれの自国の言葉で御礼を書かせていただきました。

宿泊施設に戻り、最後に、各自が 3 日間を通じて感じたことを分かち合いました。「地元の人々や行政の力に感銘を受けた。大勢のボランティアが活動していることには日本社会の善意を感じ感銘を受けた。こうした力があれば復興できると感じた」「実際に現地に来るまではわからなかった本当の津波被害の状況を知ることができた。自国に持ち帰り伝えたい」「全てが消失した実際の光景に衝撃を受けた。人々にお会いして現場の力を感じた」といった感想が出されました。また、受入先の浦田さんからは、「現地の方々には、いろいろな国の方々による応援を嬉しく思っていただけると思う」というお話もいただくことができました。

3 日間を通じて、多くの方々にお会いし、多くを学ばせていただきました。短い行程の中で現地に貢献できることは本当にわずかですが、与えていただくものはとてつもなく大きいことを実感し、こうした学びは、「環境リーダー」としての力に必ずやつながるものだと感じました。今後も FOLENS で、被災地とつながった活動を、何らかのかたちで実施していきたいと考えつつ、実習を終えました。

The last seminar in the academic year 2012 was a visit to areas afflicted by the Tohoku Earthquake and Tsunami on 11 March, 2011. Our objective was to participate in volunteer activities to help the recovery and to learn from the people and fields that have experienced and are trying to overcome this serious disaster. Six students and two faculty members participated in this trip, which was organized as a trial activity of a small scale, leading to a series of following activities. RQ Disaster Education Center, which promotes “disaster education” or facilitation of learning from

experiences of efforts to recover from disasters, coordinated our visit. Ms. Sachi Urata, RQ Tohoku staff, accompanied our entire trip.

Day 1:

From Sendai City, we drove to the north along the coastal line to witness the impacts of Tsunami.

Our first stop was Higashi-Matsushima City. All the participants were shocked and lost words while walking among destroyed houses still left as they were after a year, realizing how enormous and horrifying the disaster was and how sad it has been to lose a usual life for the people living there. As we continued our way to Onagawa Town, Ishinomaki City, and Minami-sanriku Town, we came across countless fishing towns and ports, all destroyed, along the beautiful coastal area. Ms. Urata and faculty provided information on situations of local communities and people, and geographical impacts such as coastal subsidence.

In Iriya District, Minamisanriku Town, we visited a workshop of "Minamisanriku Recovery Octopus Association". There, Mr. Abe, Director of Iriya Community Learning Center, and staff explained and showed us their activities to produce and sell goods featuring "Octopus-kun", the symbol of the local industry and recovery, and also traditional handicrafts using cocoons. We then visited a large Octopus-kun statue placed at the local shrine to pray for the recovery of the community.

After stopping by at Shizugawa Recovery Market to buy food for the dinner, we dipped in a hot spring at Hotel Kanyo – one of the important bases for evacuees and volunteers since right after the disaster. Finally, at RQ Tome Recovery Communication Center, our base for two nights, we had a dinner while each of us shared expectations for this trip such as "To understand what can happen in a disaster like this to prepare for a future disaster in an own country"; "To know what we should do after a disaster"; "To make a contribution as a volunteer"; " To see what is going on now and what have changed during one year"; and "To know the actual site of the Tsunami, that I only saw in news in a home country".

Day 2:

We started the first day of volunteer activities by making Onigiri, or rice balls for lunch. It was the first experience for many of the international students, but everyone did a good job.

The activity site was Jifuku-ji Temple in Kesennuma City. The temple is located at a higher ground, but still the tsunami almost reached its ceiling. The framework of the main building, built only three years ago, survived. We could clearly see the coast from the temple ground – it was hard to believe that the coastal view from there had been completely blocked by buildings before the tsunami. Our mission was to help gravelling the temple ground to prepare for a memorial event to pray for hundreds of people in the community who lost their lives. Members of Kesennuma Reconstruct Association, which hires local people who lost their jobs due to the disaster, were there to work together. After the work, the priest of Jifuku-ji, Shuko Katayama, kindly gave each of us a framed picture with his own calligraphy written as "Not to give away. Not to run away. Not to give up." International students were grateful to receive also a memorial CD from him.

After a dinner at the base, Ms. Urata gave a presentation on what RQ Citizens Disaster Relief Network Japan (RQ-CNJ) has done to support afflicted people in the area. RQ-CNJ was a body that networked volunteers since right after the Tohoku disaster, and recently developed into some new organizations including RQ Disaster Education Center. It has had no paid or permanent staff but individuals, who were expected to be responsible for planning and making an action on their own initiative, voluntarily formed the organization. With its flexibility, RQ-CNJ has been successful to provide support for those that government could not reach. Both students and faculty were impressed to learn such RQ-CNJ activities and philosophies, and also Ms. Urata's personal motivation, experience, and current thought.

Day 3:

On our last day, Mr. Masanori Hatakeyama and his wife, who own an oyster farm in Karakuwa Area of Kesennuma City, hosted our activity. Our mission was to support the recovery of oyster industry, by tying scallop shells to ropes to make nests for oysters to grow. The activity was coordinated by Mr. Hoshino of RQ Karakuwa Base and other volunteers also joined.

With patient and cheerful instruction of Mrs. Hatakeyama, we could somehow manage to do the work. Mr. Hatakeyama took us to the bay by his boat and explained the natural beauty and wealth of the area, impacts of the tsunami, and his vision for the recovery of oyster farming. They let us taste their delicious products, such as fresh scallops and fish, grilled oysters that survived the tsunami. Thus we had to admit what we received from them was much more than our contribution to them. At Hatakeyama's home, each of us wrote a "thank-you" message with our own languages with Japanese translation on large sheets of paper, as other volunteers who had visited had done.

After returning to the base, we shared what we had felt during the trip: "I was impressed with the power of local people and governments. Lots of volunteers came and it shows the good will of Japanese society. I believe Japan can recover." "Before coming here, I could not really understand what had happened - no houses were left after the tsunami. I want to bring what I saw to my country to learn from the experience." "I was totally shocked by the scenery to see that everything has disappeared. By meeting the people during this trip, I could realize the power of the field." Ms. Urata told us that she thought local people were happy to receive an international group and to know that people in the other places of the world support them.

Through these three days, we could meet many wonderful and powerful people who taught us much. We have to admit that our contribution was small but our earning was so big. Believing that learning in Tohoku is important for those who want to be environmental leaders in future, We recognized the need to continue activities to connect our education with Tohoku.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

2012 年度/ Academic Year 2012

テーマ/ Theme	FOLENS ファーム（農場活動）～持続可能な地域づくりと都市農業を考える / FOLENS Farm Activities – Sustainable Community Development and Urban Agriculture
日時/ Date	2012 年 3 月～ / March –, 2012
場所/ Venue	FOLENS ファーム（府中キャンパス）/ FOLENS Farm (Fuchu Campus)
プログラム/ Program	農業実地体験 / Farming experience on farm

FOLENS では、2012 年 3 月より、農場活動を始めました。府中キャンパスにある牧草地の一角に「FOLENS ファーム」と名付けた農場を開墾し、 下記のとおり活動してきました。これらの活動を通じて、我々が生きるために自然環境に手を加え恵みを受けて営む「農業」を実地で体験しながら、学生・ 教員間の交流を深めるとともに、時に近隣の方々との交流を持ちながら、都市部における農場の意義や持続可能な地域づくりとの関係について考察を深めようという試みです。 野菜や花、蕎麦などを原則的に無化学肥料・無農薬で栽培しています。

FOLENS has launched farming activities for its students and faculty in March 2012. At the “FOLENS Farm”, set up at a pasture land in Fuchu Campus, activities have been carried out as below. Our aims have included; 1) providing students opportunities to experience farm work that is a process to understand and utilize the natural environment for human life; 2) facilitate communication among FOLENS students and faculty; 3) facilitate communication between FOLENS and local residents; and then 4) develop understanding and ideas on roles of urban agriculture in sustainable community development. We have grown vegetables, flowers, buckwheat without no chemical fertilizers or pesticides and shared and enjoyed the harvests.

2012 年/ Year 2012

3 月 28 日（水） ジャガイモの植え付け
Wednesday, 28 March: Planting potatoes

5 月 12 日（土）FOLENS 新入生ウェルカムパーティ
Saturday, 12 May: Welcome Party for new FOLENS students

5 月 12 日（土）夏野菜や花（トウモロコシ・トマト・キュウリ・ナス・スイカ・ヒマワリ・マリーゴールド）の種まき（農学府科目・共生教育論合同）
Saturday, 12 May:Planting seeds of summer vegetables (corns, tomatoes, cucumbers, egg plants, bitter gourds, water melons, and flowers such as sun flowers and marigolds) (In collaboration with a graduate course "Symbiotic Education")

5 月 12 日（土）野菜や花（トウモロコシ・トマト・キュウリ・ナス・スイカ・ヒマワリ・マリーゴールド）植え付け（農学府科目・共生教育論合同）
Saturday, 12 May:Seedlings of summer vegetables (corns, tomatoes, cucumbers, egg plants, bitter gourds, water melons, and flowers such as sun flowers and marigolds) (In collaboration with a graduate course "Symbiotic Education")

5 月 23 日（水）夏野菜の世話
（農学府科目・共生教育論合同）
Wednesday, 23 May: Pruning and weeding for summer vegetables (In collaboration with a graduate course "Symbiotic Education")

6 月 18 日（月）ミーティング
6 月 25 日（月）ミーティング＆留学生母国産の野菜（空心菜・）の種まき
Monday, 18 June: Meeting Monday,
25 June: Meeting & planting vegetables from international students' countries (Chinese spinaches, corianders, Java spinaches, etc…)

6 月 29 日（金）ジャガイモ収穫（農学府科目・共生教育論合同）
Friday, 29 June: Harvesting potatoes (In collaboration with a graduate course "Symbiotic Education")

7 月 3 日（火）夏野菜の世話・収穫
Tuesday, 3 July: Weeding and harvesting summer vegetables

7 月 6 日（金）夏野菜の世話・収穫（農学府科目・共生教育論合同）
Friday, 6 July: Weeding and harvesting summer vegetables (In collaboration with a graduate course "Symbiotic Education")

7 月 9 日（月）ジャガイモ収穫
Monday, 9 July: Harvesting more potatoes

7 月 13 日（金）せせらぎ農園訪問（日野市・コミュニティファーム）（農学府科目・共生教育論合同）
Friday, 13 July: Visit Seseragi Farm (Community farm in Hino City) (In collaboration with a graduate course "Symbiotic Education")

8 月 9 日（木）夏野菜世話・収穫
Thursday, 9 August: Harvesting summer vegetables, weeding, and meeting

8 月 9 日（木）ミーティング
Thursday, 9 August: Meeting

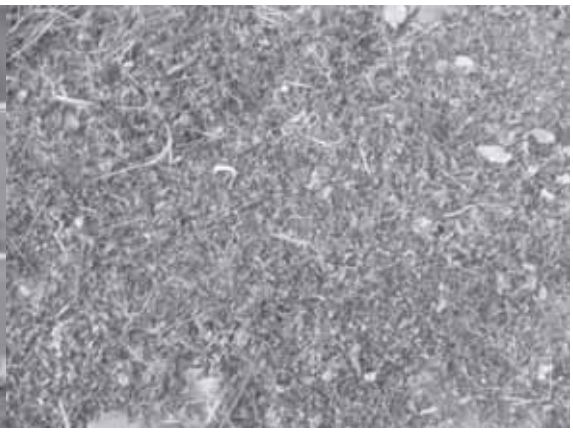
8 月 21 日（火）夏野菜の片付け/ ソバの種撒き
Tuesday, 21 August: Clearing some of the summer vegetables/ Planting buckwheat

9 月 26 日（火）夏野菜の収穫・ソバの確認・秋冬野菜の種まき
Tuesday, 26 September: Harvesting summer vegetables/ Checking buckwheat/ Planting autumn & winter vegetables (radishes, turnips etc.)

10 月 27 日（土）サツマイモ収穫・ソバの確認
Saturday, 27 October: Harvesting sweet potatoes/ Checking buckwheat


11 月 24 日（土）ソバ収穫
Saturday, 24 November: Harvesting buckwheat!


12 月 15 日（土）公開イベント農と科学の面白実験体験教室「畑たいけん」）ソバの脱穀
Saturday, 15 December: Open farm event for locals/ Thrashing buckwheat

12 月 20 日（木）蕎麦の乾燥
Thursday, 20 December: Drying buckwheat

2013 年 / Year 2013


1 月 26 日　唐箕で蕎麦を精選
26 January: Cleaning and selecting buckwheat with a non-electric traditional tools


2 月 26 日　石うすでの蕎麦粉挽き
26 February: Grinding buckwheat flour with a stone mill

3 月 13 日　土づくり
13 March: Preparation of soil

3 月 16 日　蕎麦打ち・試食
16 March: Cooking & Tasting Buckwheat Noodles!

4 月 9 日　じゃがいも植付
9 April: Planting potatoes

5 月 22 日　カボチャ・ゴーヤ植付・じゃがいも土寄せ
22 May: Planting pumpkins and bitter gourds

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	2011 年度活動レビューと 2012 年度活動計画/ Reflection on 2011 and Planning for 2012
日時/ Date	2012 年 5 月 16 日（水）/ May 16, 2012
場所/ Venue	府中キャンパス / Fuchu Campus
参加者/ Participants	学生 24 名　教員 4 名 / 24 students, 4 faculty members
プログラム/ Program	2011 年度活動の振り返りと 2012 年度の提案/ Review of FOLENS seminar activities in 2011 and planning for 2012

2011 年度の FOLENS セミナー活動を振り返る
Reviewed FOLENS Seminar activities in 2011

今年何をやりたいか、輪になってそれぞれ発表
Made presentation regarding what we would like to do in 2012

関心テーマ毎にグループを作って、具体的な提案を発表
Produced proposals by making groups based on interested theme

2012 年度第 1 回目の FOLENS セミナーを開催しました。2011 年度の活動を振り返り、2012 年度に取り組みたい活動についてブレイン・ストーミングを行いました。FOLENS セミナーは学生の関心やニーズに沿ったものであることが第一なので、このセミナーは今年度の活動の方向性を決める大事な第一歩となりました。

最初に、この 4 月から新たに FOLENS プログラムに加わった第 5 期生、5 月に着任した特任教員 2 名の自己紹介をしてスタート。その後、2011 年度の FOLENS セミナーでの活動をスライドで振り返りました。そして、昨年度の活動を踏まえて今年の FOLENS セミナーで取り組みたいことをそれぞれ紙に書き、輪になって一人一人発表しました。各学生の専門分野や問題意識、昨今の環境問題に基づいてたくさんの興味深い案が出てきました。その後、同じような関心を持つ学生同士でグループを作り、特定のテーマの下にやりたいことを絞りました。最終的に、①水、②日本の農業、③現代世界の影響、④東北視察、⑤再生可能エネルギーの５つの案が出てきました。

この日の宿題として、各グループはメーリングリストに具体的なプロポーザルを投稿し、学生は関心のあるプロポーザルに投票することになりました。そして、投票数をより多く獲得したプロポーザルが今年度の FOLENS セミナーとして実施されます。果たしてどの提案が実現するか楽しみです。

The first FOLENS seminar in academic year 2012 focused on the reflection of activities in 2011 and planning for 2012. FOLENS Seminar should be based on the interests and needs of FOLENS students, so this seminar was the important first step of this academic year.

The seminar was started by self-introduction of new FOLENS students and faculty members. It was followed by reflection of FOLENS Seminar activities in 2011 by looking at slides. Then, based on the last year's activities, each

student wrote down rough ideas for this year's activities and made presentation to other students. There were a variety of interesting ideas based on each student's area of expertise and awareness, or recent environmental issues. After hearing all the ideas, like-minded students made a group to focus on concrete proposals based on a specific theme. After all, we ended up five main issues, namely, Water, Japanese Agriculture, Effect of the Modern World, Visit to Tohoku and Renewable energy.

After the seminar, each group was tasked to post a concrete proposal to Mailing List. The proposals which attracted more students' votes will be implemented as this year's FOLENS Seminar activity. Let's see which proposal will be realized!

（今井あい/ Ai Imai）

テーマ/ Theme	金環日食観察/ Annular Eclipse Observation
日時/ Date	2012 年 5 月 21 日（月）/ May 21st, 2012 (Mon)
場所/ Venue	府中キャンパス農場/ FM Fushu test farm Fuchu Campus
参加者/ Participants	学生 16 名 教員 2 名/ 16 students and 2 faculty members
プログラム/ Program	金環日食観察 / Observation of annular eclipse

金環に入る直前/ Coming to the annular

金環の瞬間をとらえる/ The annular was captured (taken in a picture)

観察の様子/ Observation

ついに金環日食の朝がきた。予報は曇り時々晴れ。天気図では南岸に前線が延びてきており、どうなることやら気をもまされる。朝 5 時、晴れている。これは行ける！しかし 6 時半ごろ大学に向かうころ、あやしげな雲がどんどん広がってきた。心配すべきか、それとも今曇るのは後で晴れるということなのか？

7 時前、雲量約 3~4。日食グラスのほか、雲の厚みに応じて強度の違うサングラスを 2 個ともって、3 段階の Eye-Protector とするほか、天体望遠鏡をセット。すでにかなり欠けている。雲は広がり気味だが観察に支障ない。雲の厚みによって日食グラスよりサングラス 2 重の方が良い場合もある。みな各自工夫した保護メガネをもっており興奮気味に観察した。金環の瞬間、風はうすら寒かった。天体望遠鏡では吹きあがるフレ

アや黒点もはっきり見える。太陽活動が変化して、地球は寒冷化するかもしれないと、最近報じられたばかりである。

地球の自然の営みは太陽の恵みがあってこそ、環境問題の現場とは宇宙の活動ともつながっていることを実感した世紀の瞬間だった。それでも、温暖化防止の努力は続けないといけないですね。

It is The Annular Eclipse this morning. Weather forecast says it will be cloudy and sometimes sunny. The weather chart shows stationary front in the pacific, on south of Japan. So I was anxious on the weather condition. At 5:00 AM, it is nice sky. However at 6:30, on the way to TUAT, gray cloud grew up from south-east sky. Is this bad news? Or good news, indicating that it will be nice later?

7 o'clock, cloud cover rate in the sky is approximately 3-4. I prepared three eye protectors including eclipse glass and two sunglasses that have different darkness to correspond various thickness of cloud. Astrometric telescopes were set. The eclipse is already in progress. The cloud does not disturb our observation. Double sunglass is sometimes better in accordance with cloud thickness. We were excited. Wind was little bit cool during The Annular Eclipse. Solar flare and sunspots are clear in the screen of telescope. It has just reported that solar activity seems changing and the earth might be cooler.

Gift from the sun is the origin of global nature. We recognized environmental problems are linked with the space. Anyhow, we have to do our best and avoid anthropogenic global warming.

（尾崎宏和/Hirokazu Ozaki）

テーマ/ Theme	藤枝農山村実習/Field Training of farming and mountain villages at Fujieda
日時/ Date	2012 年 6 月 16 日（土）～17（日）/Jun 16 and 17, 2012
場所/ Venue	静岡県藤枝市/Fujieda city, Shizuoka Prefecture
参加者/ Participants	学生、教員　全 26 名/26 members including students and faculty
プログラム/ Program	・お茶畑見学/Looking around the tea field ・有機無農薬栽培/The organic agriculture plantation

昼食は雨の中の流しうどん /"Flowing Udon" lunch in the rain

有機無農薬栽培のお茶畑を見学/Looking around the tea field of organic agriculture plantation

晴れやかな空の下、田植え /Race planting under the pleasant sunny sky

6 月 16, 17 日、FOLENS としては今年で 3 回目の参加となる藤枝農山村実習（通称「藤枝スクール」）に行ってきました。参加者は FOLENS 学生、国際環境農学専攻の学生、教員等 26 名。藤枝では、例年どおり有機無農薬お茶栽培を営まれている杵塚さんが今年も温かく迎え入れて下さいました。

初日はすぐれない天候で、あいにくの雨の中、風流な流しうどん（農工大うどん）を美味しくいただいた後、杵塚さんが栽培するお茶畑を見学し、有機無農薬栽培についてご説明頂きました。その日の夕方は、福島県の南相馬市で被災後の農業復興に取り組む若手農家の方に原発の農業・生活への影響、復興の課題等、メディアでは伺い知ることのできない現場の声を聴く貴重な機会を得ました。

翌日、快晴の空の下、田植えをしました。この苗が、夏の暑さを乗り越えて秋に収穫されることを願いつつ。田植え後、この 2 日間を通じて感じたこと、考えたことをグループに分かれて議論しました。有機農業、原発、食の安全等グループ毎に異なるテーマで発表し、互いの意見を共有しました。最後に、杵塚さんから総括をして頂き、一人一人が、原発問題、食の安全、人間の幸せ、そして平和についてよく考えて、そして行動してほしいという強いメッセージが伝えられました。

今年もまた「藤枝スクール」は、「食と農」というテーマの下に、見て、聞いて、感じて、そして各個人がそれぞれの立場で求められている役割をよく考えて行動することの大切さを学ぶ貴重な機会を提供してくれました。

On 16-17 June, we went on our Field Trip to Fujieda, so called “Fujieda School”. This is the third year for FOLENS to join the trip. We had a participation of 26 people including FOLENS students, IEAS students and faculties. In Fujieda, Kinezuka family, organic farm owner, welcomed us this year again.

Unfortunately it was raining on the first day. After the “Flowing Udon” (TUAT Udon!) lunch in the rain, we went up the hill and looked around the tea field as Mr. Kinezuka kindly explained the organic agricultural method. In the evening, we had a special lecture from a young farmer who worked for reconstruction of agriculture in Minami Soma, Fukushima. He talked about the impact of nuclear power plant on agriculture and people’s life and challenges of reconstruction.

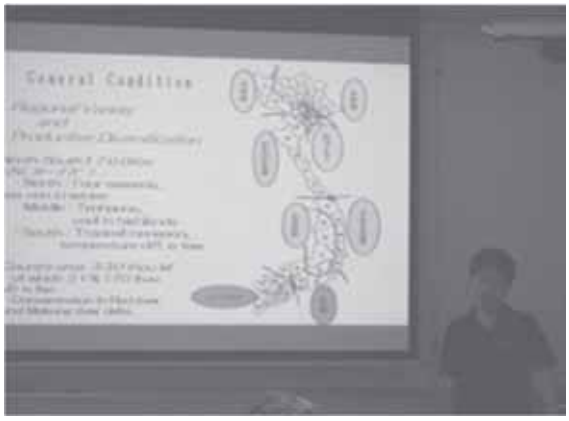
The next day, we experienced rice planting under the pleasant sunny sky wishing that seedlings would survive hot summer and to be harvested in autumn. After rice planting, students together with other local participants were divided in to small groups to discuss and exchange view what they felt and thought. Each group presented their discussion on a variety of themes including organic agriculture method, nuclear power plant and food safety. At the end, Mr. Kinezuka sent a strong message to us that each of us should think deeply about food safety, happiness of human beings and importance of peace and act rightly.

“Fujieda School” provided us a valuable opportunity to watch, listen and feel under the theme of “Food and Agriculture” and learn the importance to act by reflecting the role of each individual.

（今井あい、米田健一/Ai Imai, Kenichi Yoneda）

テーマ/ Theme	ベトナム事前学習会：メコンデルタの自然環境と農業、それらへの人為インパクト/ Pre-Lecture for Vietnam Field Training “Nature and human impacts in the Mekong Delta”
日時/ Date	2012 年 7 月 17 日/ July 17, 2012
場所/ Venue	農工大府中キャンパス/Fuchu Campus TUAT
参加者/ Participants	学生 12 名・教員 4 名/ 12 students & 4 faculty members
プログラム/ Program	・海外フィールド実習事前講義：小杉正先生（アグレコ・コスギ）、多羅尾光徳先生（農工大農学府）/ Pre-lectures for field training in Vietnam by Prof Sho Kosugi (Agreco Kosugi) and Prof. Mitsunori Tarao (Faculty of Agriculture TUAT)

多羅尾先生による熱帯地域の糞便汚染モニタリングに関する講義



小杉先生はベトナム国内でも南北で大きな違いがあることを強調された

7 月の FOELNS セミナーは、9 月の海外フィールド実習（ベトナム・メコンデルタおよびバックマー国立公園）の事前勉強会として開催されました。この実習は、FOLENS オフィス・カントー大学・バックマーチャコールプロジェクトで共催予定のものです。そして本セミナーは、実習参加者のみならず、多くの FOLENS 学生に本実習内容を参考としてもらいながら各自の学習や研究に役立ててもらうことを、目指しています。 講師は本学の多羅尾光徳先生（環境微生物学）と、本学非常勤講師・国際農業研究コンサルタントの小杉正先生（農業開発・経営経済学）にお願いしました。多羅尾先生は、メコンデルタという熱帯域で、社会に密接にかかわる水環境の評価のため、大腸菌指標が糞便性汚染の解析指標に使えるかの研究内容、上流域で続くダム建設に伴うメコンデルタの環境変化への懸念について講義いただきました。小杉先生には、ベトナムにおける近代農業の推移と現状、その南北差について講義され、ベトナム国内だけでなく広くアジアへ波及するメコンデルタの稲作農業と近年成長しつつある果樹生産について紹介いただきました。

FOELNS seminar in July, has been held as a pre-study session for the overseas field training in Vietnam (Bach Ma National Park and the Mekong Delta) which will be organized jointly by FOLENS, Can Tho and Bach Ma charcoal project in September. We aimed that many FOLENS students as well as the participants of the overseas field training in Vietnam have chance to know about Mekong Delta and apply to their own learning and research. Associate Professor TARAO Mitsunori (environmental microbiology) and Professor KOSUGI Sho (agricultural development economics and management) were invited as lecturers. Dr. Tarao talked about a research whether coliform and E.Coli indicate fecal contamination in tropical regions such as Mekong Delta. He also emphasized that Dam construction in upper

Mekong is a great concern for environmental change in the Mekong basin in the future. Prof. Kosugi talked about modern agriculture in Vietnam and its temporal change and north-south contrast. The rice cultivation in Mekong Delta and export occupies a large portion in world market while fruit production in the area is growing a lot recently according to his lecture.

（尾崎宏和/Hirokazu Ozaki）

テーマ/ Theme	黒部実習/Field Training in Kurobe
日時/ Date	2012 10 月 11 日 12 日/October 11 and 12, 2012
場所/ Venue	黒部ダム/Kurobe Dam
参加者/ Participants	
プログラム/ Program	長野県の水力開発の歴史、システム、可能性と制約条件について学ぶ /Learn history, system, potential and constraint condition of hydropower development in Nagano prefecture

NPO 地域づくり工房 / 川上ミニ水力発電所/NPO community development factory/Kawakami Mini Hydropower Station

大町ダムの内部を見学 /Exploring inside the Omach dam

黒部ダムの放水/The discharge water from the dam

10 月 11-12 日、国際環境農学(IEAS)と合同で長野県にフィールド実習に行きました。今回の実習の目的は、長野県の水力開発の歴史、システム、可能性と制約条件について学ぶこと、そして雄大な自然に慣れ親しむことでした。

初日、まずは長野県大町市にある「NPO 地域づくり工房」の傘木代表より同市で取り組まれているミニ水力発電事業について解説して頂き、実際に二つのサイト、「川上ミニ水力発電所」と「駒沢ミニ水力発電所」を訪れました。いずれも 100 ワット未満の発電量で規模は小さいながらも地域の自然資源を生かした発電風景を見ることができました。次に、ロックフィル形式の七倉ダム、コンクリート重力式の大町ダムを訪れました。七倉ダムでは、200 段近くある階段を上ってその壮大さを実感！大町ダムでは、大町ダム管理所のご協力を頂き、ダム内部、ダムゲート操作室の両方を見学させて頂き、ダムの果たす役割について深く学びました。二日目の朝、日本最古の水力発電所である宮城第一発電所を訪れ、中部電力の大町電力所の皆さまのご協力を頂き、107 年前にドイツから輸入された発電機を見学し、水力発電の仕組みを学び、その歴史の深さを実感しました。最後の訪問場所は日本最大級のダムである黒部ダムへ。アーチ式コンクリートダムの大きさ、自然との調和の美しさに圧倒されました。

今回は大小様々な規模の水力発電の現場を訪れて、これからのエネルギー問題を考える契機を得ることができたのではないかと思います。

On 11-12 October, we had a field trip together with IEAS to Nagano prefecture. The purpose of the trip was to learn history, system, potential and constraint condition of hydropower development in Nagano prefecture as well as to enjoy the beautiful nature.

On the first day, “NPO community development factory” introduced mini hydropower projects and showed us two sites; “Kawakami Mini Hydropower Station” and “Komazawa Mini Hydropower Station”. We could see how to generate electricity with natural resource in the community in micro scale. In the afternoon of the first day, we visited Nanakura dam, rock-fill dam, and Omachi dam, concrete gravity dam. At Nanakura, we climbed up 200 steps to feel the great scale of the dam. At Omachi, with the kind cooperation from Omachi dam management office, we could explore inside the dam and dam gate control room to deepen our understanding of the role that dam plays. In the morning of the second day, we visited the oldest hydropower facility in Japan, Miyashiro Daiichi Power Station. Chubu electric company kindly introduced us inside the station to see the oldest generator in Japan, imported from Germany 107 years ago. We could learn the mechanism of hydropower generation and felt the long history of it. Lastly, we visited one of the largest dams in Japan, Kurobe dam. We experienced the large scale arch type concrete dam and the beautiful harmony with the nature.

This time, we have visited several hydropower stations and could get to know one aspect of energy issues in Japan.

（今井あい、米田健一/Ai Imai, Kenichi Yoneda）

テーマ/ Theme	東日本大震災・福島原発事故後の生活と農業～福島訪問事前講義/ Life and Agriculture after Tohoku Earthquake and Fukushima Nuclear Disaster
日時/ Date	2012 年 11 月 19 日（月）16～18 時 / November 19, 2012
場所/ Venue	府中キャンパス / Fuchu Campus
参加者/ Participants	学生 25 名・教員 6 名/ 25 students & 6 faculty members
プログラム/ Program	・原発事故と農業～概観（二ノ宮リムさち） ・原発事故と畜産～概観（森山浩光） ・農工大教員による取組：横山先生・荻原先生・五味先生各プロジェクトの紹介（尾崎宏和） ・二本松市東和地区における有機農業と放射能汚染（木村園子ドロテア） ・12 月福島実習の概要（二ノ宮） -Fukushima Daiichi Nuclear Power Plant Accident: Overview (Ninomiya-Lim) -Nuclear Power Plant Accident and Animal Husbandry (Moriyama) -Action of TUAT Faculty (Ozaki) -Organic Farming and Radiation Pollution in Towa District, Nihonmatsu City, Fukushima (Kimura) -Outline of Fukushima Visit in December (Ninomiya-Lim)

2012 年 11 月～2013 年 1 月の FOLENS セミナーは、2012 年度 FOLENS セミナーの重要テーマとして年度当初に学生ディスカッションと投票によって決め られた「日本の農業」「東北」に基づき、「東日本大震災・福島原発事故後の生活と農業」をテーマに 3 回シリーズ で実施しました。

2011 年 3 月 11 日の東日本大震災に伴う東京電力福島第一原子力発電所事故は、放射性物質の大量放出・拡散による甚大な 環境汚染をもたらし、地域の生活と産業は大きな 打撃を受け、特に農業は大変厳しい状況に直面しました。そうした中、農家をはじめとする地元住民の方々は様々な対策に取り組んでおり、また、本学教員の多くも それぞれの専門分野において対策を模索しています。この連続セミナーでは、FOLENS を履修する様々な国々・専攻分野の大学院生たちが、現地で日々の生活を営み、 困難に立ち向かう地元の方々にお会いしてお話を聞くなかから、 ①原発事故による放射能汚染に直面する地域の生活 と農業の現状、様々な取組から学び、 ②福島・地元・世界の課題と、自身の専門・関心分野との結び付きについて考え、今後の 自身の行動につなげることを目的に計画しました。

19 日の「事前講義」では、下記プログラムに沿って FOLENS 内外の農工大教員や FOLENS 学生から講義・発表がありました。 特 に農学府国際環境農学専攻の木村園子ドロテア准教授からは、震災以前から「ゆうきの里東和」としての地域づくりに取り組んで きた二本松市東和地区の背景や、 震災後現地で実施

している土壌の放射能汚染に関する調査・除染実験の概要などについて報 告があり、12 月の現地訪問を前に状況の理解と関心を深める機会となりました。

FOLENS Seminars from November 2012 to January 2013 featured the theme “Life and Agriculture after Tohoku Earthquake and Fukushima Nuclear Disaster”. This was based on the result of the students’ discussion at the beginning of the year where “Japanese agriculture” and “Tohoku” were selected as the most important topics to focus on in this year’s FOLENS seminar activities. The Fukushima Daiichi Nuclear Power Plant Accident, occurred following the Tohoku Earthquake on 11 March 2011, has caused extensive environmental pollution with mass emission of radioactive materials into the air. This has resulted in serious damages to lives and industries of local communities.

The situation of agriculture in the area has been especially severe. Local people, including farmers, have been taking various actions to face the challenges and many of TUAT faculty members have been also trying to support such actions from various specialties and approaches. Under such situation, this series of FOLENS Seminars provided students from different countries and fields to meet the people in Fukushima to; 1) learn from the current situation of people’s lives and agriculture, and the various actions being taken in local communities; and 2) deepen thoughts on how issues in Fukushima, students’ own communities, and the world, are connected, how such issues and their own specialty fields can be connected, and what action they can actually take.

In the seminar on 19 November, information on the radiation contamination and its impact on local communities and agriculture was shared as preparation for the Fukushima visit in December. Among them was a lecture by Associate Professor Sonoko Dorothea Bellingrath-Kimura of Faculty of Agriculture, who introduced her research work in Towa District, Nihonmatsu City, to develop technology to remove radioactive materials from the soil. She also explained the background of Towa that has promoted sustainable community development with organic agriculture since before the accident and how such community development activities worked as a basis for taking actions in collaboration with outsiders after the accident. Through the seminar, the participants gained knowledge and clarified their interests for the visit in next month.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	東日本大震災・福島原発事故後の生活と農業～福島（二本松・南相馬）訪問/ Fukushima Visit – Life and Agriculture after Tohoku Earthquake and Fukushima Nuclear Disaster
日時/ Date	2012 年 12 月 17 日～18 日 / December 17-18, 2012
場所/ Venue	二本松・南相馬 / Nihonmatsu City & Minamisoma City
参加者/ Participants	学生 28 名・教職員 7 名 / 28 students & 7 faculty members
ア	12 月 17 日（月） 6:40　農工大府中キャンパス正門（本館前）集合 7:00　出発（バス） ・オリエンテーション：二ノ宮 ・講義・話題提供：木村、ほか 11:30　二本松市　道の駅ふくしま東和着 震災・原発事故後の有機農業と放射能汚染：ゆうきの里東和　里山再生・災害復興プログラム「汚染を減らし、農業を復興するモデルを創る～ 被災 2 年目に見えてきたこと」：武藤正敏さん（ゆうきの里東和ふるさとづくり協議会　専務理事・事務局長） 13:00　昼食（道の駅） 14:00　農工大教員による調査地見学・調査活動内容等に関する解説（木村・五味） 14:45　グループごとに農家民宿へ移動（民宿からの送迎車）：作業手伝い・交流 夜　　農家民宿 12 月 18 日（火） 7:45　道の駅ふくしま東和集合 8:00　出発 飯館村通過：飯館の震災・原発事故被害と現状に関する解説（佐野） 9:30　南相馬市民情報交流センター着 10:00　南相馬・浪江の震災・原発事故被害と現状に関するお話（南相馬市民情報交流センター・大会議室） ・10:00-10:30 震災・原発事故後の住民生活：高橋美加子さん（北洋舎クリーニング代表取締役・つながろう南相馬） ・10:30-10:45 市民活動拠点「みんな未来センター」の活動：竹内容堂さん（みんな未来センター　理事） ・10:45-11:30 警戒区域内における家畜の現状と保護活動：吉沢正巳さん（希望の牧場～ふくしま　理事） http://fukushima-farmsanctuary.blogzine.jp/ 11:50　お食事処「食彩庵」（福島県南相馬市原町区本町２丁目５２　T0244-26-8040）へ移動 12:00　昼食・現地講師と交流（希望者は時間があればみんな未来センター見学） 12:45　バス乗車：南相馬市内見学 ・小高地区津波跡：今野由喜さん（小高区塚原地区行政区長） ・希望の牧場～ふくしま（敷地内は線量が高い（3μ Sv/h）ため入口まで。希望者のみ降車） 15:00 頃　南相馬出発 21:00　農工大府中キャンパス着 **Day1 (17 December)** 6:40 Meet at Main Gate (in front of Main Building/HONKAN), TUAT Fuchu Campus 7:00 Depart (Bus) ・Orientation: Ninomiya-Lim ・Lecture/Talks: …

	11:30 Arrive in Towa Roadside Station, Nihonmatsu City, Fukushima Pref. Talk by Mr. Masatoshi Muto, Executive Director, Committee for Organic Farming and Community Development in Towa: Satoyama Recovery and Sisaster Restoration Program – Model for Reducing Contamination and Reconstructing Agriculture – What we see in the second year of the disaster 13:00 Lunch 14:00 Visit Research Sites of TUAT Faculty (Kimura/ Gomi) 14:45 Go to Farmer's Guest Houses/ Work and Talk with Farmers in Towa Dinner & Sleep at Farmer's Guest Houses **Day2 (18 December)** 7:45 Meet at Towa Roadside Station 8:00 Depart Go through Iitate – Talk on Situation of Iitate – known as one of "the most beautiful villages" in Japan but now a restricted zone (Sano) 9:30 Arrive in Minami Souma City 10:00 Talks on Situation of Minamisouma & Namie Area after the Earthquake and Nuclear Disaster ・10:00-10:30　Ms. Mikako Takahashi (CEO, Hokuyosha Cleaning Company/ Tsunagaro Minamisouma): Local Community's Life after the Earthquake and Nuclear Disaster ・10:30-10:45 Mr. Youdou Takeuchi (Minna Mirai Center): Activities of Minna Mirai Center as a Base of Civic Action ・10:45-11:30 Mr. Masami Yoshizawa (Representative, Farm Sanctuary Fukushima): Situation of Livestock in Evacuated Zone 11:50 Go to Restaurant Shokusaian 12:00 Lunch with Speakers /Those who finish early can visit Minna Mirai Center (Everyone Future Center) 12:45 Bus ・Odaka – the area afflicted by tsunami: Guided by Mr. Yoshiki Konno, Head of Tsukahara District, Odaka ・Farm Sanctuary Fukushima (Only to the gate (1.5μ Sv/h) as the radiation level inside the farm is as high as 3μ Sv/h. Those who wish to get off the bus can do so.) 15:00 Depart 21:00 Arrive in TUAT Fuchu Campups

ゆうきの里東和ふるさとづくり協議会・武藤正敏事務局長による講義「汚染を減らし、農業を復興するモデルを創る～被災 2 年目に見えてきたこと」
Talk by Mr. Masatoshi Muto, Executive Director, Committee for organic farming and community development in Towa: "Model for Reducing Contamination and Reconstructing Agriculture"

木村園子ドロテア准教授による放射能による土壌汚染調査実験地での解説
Talk by Mr. Masatoshi Muto, Executive Director, Committee for organic farming and community development in Towa: "Model for Reducing Contamination and Reconstructing Agriculture"

農家民宿では、りんご・きのこ・長ネギなどそれぞれの農家の生産物について話を聞く
Learning about crops produced in each farm inn such as apples, mushrooms, and green onions

農家民宿で豪華な夕食を囲みながら農村の暮らしや放射能汚染の影響について話を聞く
Learning about rural life and impacts of radiation contamination with a dinner of delicious local food at a farm inn

南相馬市民リーダー高橋美加子さん、「希望の牧場」の吉沢正巳さんらによる講義と質疑応答
Lecture and Q&A with Ms. Mikako Takahashi, a local leader, and Mr. Masami Yoshizawa of "Farm of Hope", in Minamisouma

警戒区域内の家畜を保護する「希望の牧場〜ふくしま」
Entrance to Farm of Hope where cattle left in a restricted zone are gathered and protected

放射能計測器を携行し汚染を実測
Measuring air radiation levels

警戒区域から避難指示解除準備区域となりようやく地震で倒壊した建物の撤去が進む南相馬市小高区中心部
Downtown Odaka of Minamisouma where houses collapsed by the earthquake are being removed after being categorized as "the area to which evacuation orders are ready to be lifted"

津波の甚大な被害を受けた小高区で今野由喜さんより津波当時から現在までの状況について聞く
Visit to a district of Odaka attacked by tsunami, guided by Mr. Yoshiki Konno telling the situation on 11 March and after

「東日本大震災・福島原発事故後の生活と農業」をテーマとした 2012 年 11 月〜2013 年 1 月の FOLENS セミナー。 その中核となる福島訪問を実施しました。 ①原発事故による放射能汚染に直面する地域の生活と農業の現状、様々な取組から学び、 ②福島・地元・世界の課題と、自身の専門・関心分野との結び付きについて考え、今後の自身の行動につなげることを目的として、 1 日目は二本松市東和地区、2 日目は飯舘村を通って南相馬市を訪れ、様々な方々にお話を伺いました。

1 日目：

二本松市東和地区は、震災後「ゆうきの里東和ふるさとづくり協議会」が窓口となって、本学を含む複数の大学・研究者と連携し、 放射能汚染の状況把握や農業再生へ向けた取組を進めている地域です。今回は、まず協議会事務局長の武藤正敏氏よりこれまでの 取組についてお話しいただいた後、本学の木村園子ドロテア准教授の土壌汚染に関する調査実験地を視察し、五味高志准教授からも 地形と放射性物質の移動に関する解説がなされました。その後、5 班に分かれて地区内の「農家民宿」にて各農家さんの状況について

お話を伺いました。本来であれば作業を手伝うはずが、あいにくの天気から室内の炬燵で暖まりながらゆっくりと話を聞いたという班もありました 。学生の中には日本の農家を初めて訪れるという者も多く、豊かな農村の暮らしに触れ、美味しい料理を味わい、温かなおもてなしを受けたことに 皆感動し、またそのなかに原発事故がもたらした影響について改めて真剣に考えさせられました。

2日目：

農家民宿の皆さんとお別れし、バスで南相馬へ。福島第一原発から 20km 圏外、大半が 30km 圏外にありながら、深刻な汚染を受けて計画的避難区域と なった飯舘村を通りながら、現地コーディネーターの佐野淳也さんより、「までいの村づくり」として広く知られてきた持続可能な地域づくりの取組や、 原発事故後の村民の状況等について解説していただきました。南相馬市では、南相馬市民のリーダーとして原発事故後積極的にメッセージを発信し続ける 高橋美加子さん、「みんな未来センター」戸田代表の代役として急遽来てくださった竹内容堂さん、警戒区域内に取り残された家畜を保護している 「希望の牧場」の吉沢正巳さん、そして津波の被害を受けた小高区の今野由喜さんに、震災・原発事故後の苦難とそれに立ち向かう活動、様々な想い、 参加者へのメッセージを話していただきました。昼食を囲んだ後は、警戒区域となっている浪江町との境にある「希望の牧場」で吉沢代表のお話を聞き、 さらに今野地区長の案内で避難区域となっている小高区中心市街地、さらに今も津波によって壊された車や家が残る津波被災地を訪問しました。地震、 津波、原発事故がもたらした深刻な状況を目の当たりにして一同衝撃を受けつつ、帰路につきました。

帰りの車中では各人が感想を述べ合い、「原発事故によって、世代間・家族間・福島県内外の避難者間等、様々な分断が起きているという話が心に残った 。自分も何かをしたい。」「もっと若者が福島のことを知ることが必要だと思った。ただ、より多くを知ることでより混乱したことも事実。何が本当にいい ことなのかわからない。もっと考えなければならない。」「津波や原発事故についてこれまでも知ってはいたが、実際の現場を見ることができてよかった。 自分の国でも原発建設計画がある。充分な検証が必要だと思う。」といった声が聞かれました。

A team of 28 students (26 FOLENS and 2 others) and 7 faculty members visited Fukushima as part of the seminar series on “Life and Agriculture after Tohoku Earthquake and Fukushima Nuclear Disaster” between November 2012 and January 2013. The destinations were Towa District of Nihonmatsu City (Day 1), Iitate and Minamisouma (Day 2), where we met various people striving in difficult situations following the earthquake and nuclear power plant accident. Our aims were to 1) learn from the current situation of people’s lives and agriculture, and the various actions being taken in local communities; and 2) deepen thoughts on how issues in Fukushima, students’ own communities, and the world, are connected, how such issues and their own specialty fields can be connected, and what action they can actually take.

Day 1:

Towa District of Nihonmatsu City, with its local committee Yuki no Sato Towa Furusatozukuri Kyougikai (Committee for Organic Farming and Community Development in Towa) as a contact point, has cooperated with

researchers from several universities since before the accident. After the disaster, their cooperation has focused on research to understand the situation of radiation contamination in the area and to implement actions for the recovery of agriculture. In this visit, Mr. Masatoshi Muto, Executive Director of the Committee, explained their activities. After that, we visited a research site of Assoc. Prof. Sonoko Dorothea Bellingrath-Kimura, where she introduced her study on the reduction of radioactive materials in farm soils. Assoc. Prof. Takashi Gomi also explained about the relationship between the geographical formation and radionuclide transfer.

The team was then divided into five groups for a visit and stay at farm inns in the district. At each farm inn, the participants spent several hours working and talking with the farm inn owners and their family to learn about rural life, agriculture, and impacts of radiation contamination on them. Some of the groups enjoyed KOTATSU, or a heating table, a traditional heating appliance in Japan. For some of the participants, it was the first time to visit a farm in Japan. The richness of rural life, delicious meals with local food, and great hospitality impressed many of us. At the same time, it was a valuable opportunity for all to think about the nuclear power generation and its issues once again.

Day 2:

After leaving farm inns and Towa, we headed to Minamisouma by bus. On the way, we drove through Iitate Village, which has been incorporated into the Deliberate Evacuation Area due to the high level of radiation contamination, although it is totally out of the 20km zone or even mostly out of the 30km zone. Mr. Junya Sano, the local coordinator of the visit, explained the sustainable community development activities in Iitate that has been known as one of the "most beautiful villages in Japan", and the life and action of Iitate residents under evacuation.

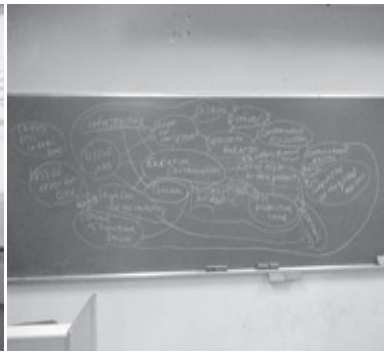
In Minamisouma, we had a lecture by four speakers: Ms. Mikako Takahashi, who has been an active leader of Minamisouma residents; Mr. Youdou Takeuchi of Minna Mirai Center (Everyone Future Center); Mr. Masami Yoshizawa of Farm of Hope, who protects cattle left in the restricted zone; and Mr. Yoshiki Konno of Odaka District, the area of Minamisouma severely attacked by tsunami. Their talks included hardships and challenges caused by the earthquake and the accident, actions to face such challenges, their thoughts while going through such experience, and messages for the participants. After lunch with the speakers, we visited Farm of Hope, which is at the border between Minamisouma and Namie Town. We also visited downtown Odaka where no one is allowed to live yet, and also the coastal area where cars and houses collapsed by tsunami still remain. All of us were shocked to actually see the serious outcomes of the earthquake, the tsunami, and the nuclear power plant accident.

On the way back, the students shared their impressions of the trip: "What I remember most from this visit is the division of people after the accident, for example, between generations, family members, and evacuates in different places. I want to do something."; Young people should know more about Fukushima, but it is also true that the more I know, the more I'm confused. I don't know what is actually right. I need to think more,"; "It was good to visit and actually see the site although I knew some about tsunami and nuclear power plant accident from media. In my country there is also a plan to establish a nuclear power plant. I think thorough inspection is necessary".

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	東日本大震災・福島原発事故後の生活と農業～事後講義とディスカッション：自分たちにとっての原発・放射能問題を考える / Life and Agriculture after Tohoku Earthquake and Fukushima Nuclear Disaster – Follow-up Lecture and Discussion
日時/ Date	2013 年 1 月 15 日（火）/ January 15, 2013
場所/ Venue	府中キャンパス / Fuchu Campus
参加者/ Participants	学生 21 名・教員 2 名 / 21 students & 2 faculty members
プログラム/ Program	・こどもみらい測定所　石丸偉丈所長のお話～原発事故による放射能汚染の現状と市民測定所の役割 ・福島訪問の概要ふりかえり（二ノ宮） ・ディスカッション～何が問題なのか？必要な対策は何か？自分たちにできること・すべきことは何か？ ・ゲスト＆教員のコメント · Talk by Mr. Hidetake Ishimaru, Director, Kodomo Mirai Sokuteijo (MEMOLI: Measuring and Mothering for Life/ a radiation measuring laboratory in Kokubunji established by a civic group) - What is MEMOLI? - Action as consumers and action as citizens (background, mission, etc) - Radiation contamination in Kanto/Tokyo areas - Radiation contamination of food products - Further challenges · Overview of Fukushima Trip (Ninomiya-Lim) · Discussion: “What are the Problems? What are the Solutions? What Can/Should We Do?” · Closing comments by Mr. Ishimaru & faculty

こどもみらい測定所・石丸偉丈所長による放射能汚染の現状や市民測定所に関する講義
Lecture by Mr. Hidetake Ishimaru about radiation pollution and roles of citizen-operated radiation measurement laboratories



12 月の福島訪問もふりかえりつつ問題の全体像を描き出す
An overall map of issues in relation to the nuclear power plant disaster and radiation pollution, created through discussion

グループ討論：必要な対策は何か？自分たちは何ができるか？
Group discussion: What are the solutions?/ What should/can we do?

「東日本大震災・福島原発事故後の生活と農業」をテーマに実施した 12 月の福島訪問をふりかえり、改めて自分たちにとっての原発事故や放射能汚染について知り、必要な対策について考えるために、事後セミナーを実施しました。学外講師として国分寺市に設立されている市民放射能測定拠点「こどもみらい測定所」の石丸偉丈所長をお招きしました。

石丸所長から、原発事故を受けた環境や食品の放射能汚染の状況や、市民測定所の取組と役割についてお話しいただき、学生らは自らが暮らす地域での市民の取組に真剣に耳を傾けていました。続いて、福島訪問

をスライドでふりかえった後、改めて「何が問題なのか」を話し合い、原発事故・放射能汚染にまつわる問題の全体像を黒板に描きだしながら、環境・社会・経済のあらゆる側面から問題が生じており、それらが互いに複雑に絡み合っていることを認識しました。さらにグループに分かれ、「対策として何が考えられるか」「自分たちにできること・すべきことは何か」をテーマに話し合い、発表しました。政府・社会・個人といった様々なレベルで取り組むべきことを挙げつつ、研究者として、消費者として、また一市民としての自らのあり方をふりかえりました。最後に「原子力発電」の是非に関して複数の学生から対立する発言があがり、議論がなされましたが、時間を大幅に超過したため、今回のセミナーは終了となりました。今後さらに議論を続ける必要性が強く認識されました。

The seminar in January 2013 was a follow-up lecture and discussion to reflect on our Fukushima visit in December, with a theme of “Life and Agriculture after Tohoku Earthquake and Fukushima Nuclear Disaster”. To learn about the impact of the Fukushima Daiichi disaster and radiation pollution on our life, Mr. Hidetake Ishimaru, Director of MEMOLI (Measuring and Mothering for Life), a radiation measuring laboratory in Kokubunji established by a civic group, was invited as a guest speaker.

Director Ishimaru presented the impact of radiation pollution on the environment and food and the roles of citizen-operated measuring laboratory. The story about action by residents in their own community inspired the participants. We then shared our experience in Fukushima with slides, and discussed “what the problems are”. A map of the issues drawn on a blackboard based on the discussion showed that the issues had multiple aspects including environmental, social, and economic, and that they are intertwined with each other. The participants were divided into groups for further discussion on the question; “what are the solutions?” and “what should/can we do?”. As each group presented their discussion, various actions necessary at different levels such as government, society, and individuals were raised. The participants also reflected on what they should do as a researcher, a consumer, or as a citizen. At the end of the discussion, conflictive opinions about the nuclear power generation were raised by different students. While the seminar had to end due to the time, we all realized the great importance of continuous discussion on the issue.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	北九州エコタウンと環境ミュージアム/Kitakyushu Eco-Town and The Environmental Museum
日時/ Date	2013年2月28日 ～3月1日/February 28 and March , 2013
場所/ Venue	北九州エコタウン/Kitakyusyu Eco-Town
参加者/ Participants	学生7名　教員4名/7 students and 4 faculty
プログラム/ Program	プログラム(大学での発表者) 2月28日（木）8：35羽田空港第一ターミナル2階中央案内所集合 第一日目：北九州エコタウン事業全体概要説明（Fig.1, 13:30～） 1.廃空き缶をリサイクルしてアルミとスチールの素材を作る(Fig.2, Mr. Hadian) 2.廃木材と廃プラから合成木材とベンチを作る(Fig.3, Mr. Hossein) 3.九州工業大学の生ごみから生分解性プラスチックを合成して、その生分解性プラツチックのリサイクル使用の実証研究 (Fig. 4, Miss. Vicheka) 4.福岡大学の廃棄物処分場の研究 (Fig.5) 第二日目 5. 廃PETボトルからプラスチックのフレークとペレットを作り、それから帽子、制服等を作る(Fig.6, Mr. Rahman) 6. 廃医療廃棄物からセメントプラントで使う金属、RDFとリサイクルコンテナを作る(Fig. 7, Miss. Kinh) 7. 環境ミュージアムの「地球の道」（倉本聰さん創作）で、地球の歴史と環境を学んだ(Fig. 8, 12:30-13:30) 8. 廃蛍光管の両端を切り蛍光管を砕き、アルミ、蛍光体と水銀を回収 (Fig, 9, Miss. Elena) 9. 廃コピー機よりプラスチック、アルミと路盤材を作る(Fig.10, Mr. Hiep) 学生の感想としては、次のようなことが聞こえた。 3月8日の発表会でさらに詳しく聞いてみる予定。 ・リサイクル事業は大変だ ・廃棄物のReduce, Reuseをできるだけやり、次にrecycleをやる ・地球を大切にしたい ・廃棄物のリサイクルは出来る ・ここで学んだことを皆に伝えたい ・日本の技術は素晴らしく、日本人は勤勉だ **Program（The student presented at TUAT）** Meeting Time: 8:35 Feb. 28th at 2nd Floor information desk of Haneda airport No.1 Terminal **First Day**：General information of Kitakyushu Eco-Town(Fig.1, 13:30～) 1.Reproduce aluminum and steal from waste can (Fig.2, Mr. Hadian) 2.Reproduce compound board and bench from waste wood and plastic (Fig.3, Mr. Hossein) 3.Practical research on making biodegradable plastic from garbage and its recycle use by Kyusyu Technical Institute (Fig.4, Mss. Vicheka) 4.Waste landfill research by Fukuoka University(Fig.5) **Second Day** 5.Reproduce flake and pellet of plastic to make cap and uniform from waste PET bottle (Fig.6, Mr. Rahman) 6.Reproduce metal for cement plant, RDF and recycle container from medical waste (Fig.7, Miss. Kinh) 7.We learned a lot about earth history and environment from Road of the Earth produced by Mr. Satoshi Kuramoto (Fig.8, 12:30-13:30). 8.Reproduce aluminum, fluorescent and mercury from fluorescent tube by

	cutting the edge and breaking tube (Fig.9, Miss. Elena) 9.Reproduce plastic, aluminum and roadbed material from copy machine (Fig.10, Mr. Hiep) Student impression is below, ・Hard work to recycle ・Promote reduce, reuse waste first then recycle ・Cherish the earth ・We could recycle the waste ・Tell my friends what I saw and heard ・Japanese technology is wonderful and Japanese people are diligence

Fig.1 北九州エコタウンセンターでの概要説明/ General information of Kitakyushu Eco-Town

Fig.2 廃空き缶をリサイクルしてアルミとスチールの素材を作る/ Reproduce aluminum and steal from waste can

Fig.3 廃木材と廃プラから合成木材とベンチを作る/ Reproduce compound board and bench from waste wood and plastic

Fig.4 北九州工業大学での生ごみから生分解性プラスチック生成プロセスの説明/ Practical research on making biodegradable plastic from garbage and its recycle use by Kyusyu Technical Institute

Fig.5 福岡大学の廃棄物処分場の研究/ Waste landfill research by Fukuoka University

Fig.6 廃 PET ボトルからプラスチックのフレークとペレットを作り、それから帽子、制服等を作る/ Reproduce flake and pellet of plastic to make cap and uniform from waste PET bottle

Fig. 7 医療廃棄物からセメントプラントで使う金属、RDF とリサイクルコンテナを作る/ Reproduce metal for cement plant , RDF and recycle container from medical waste

Fig. 8 環境ミュージアムの「地球の道」（倉本聰さん創作）で、地球の歴史と環境を学んだ/ We learned a lot about earth history and environment from The Road of Earth produced by Mr. Satoshi Kuramoto

Fig.9 廃蛍光管の両端を切り蛍光管を砕き、アルミ、蛍光体と水銀を回収/ Reproduce aluminum, fluorescent and mercury from fluorescent tube by cutting the edge and breaking tube

Fig.10 廃コピー機よりプラスチック、アルミと路盤材を作る/ Reproduce plastic, aluminum and roadbed material from copy machine

２月の FOLENS セミナーを 2 月 28 日と 3 月 1 日北九州エコタウンと環境ミュージアムで学生 7 名、教員４名で実施した。

北九州エコタウン事業は、さまざまな廃棄物を他の産業分野で活用し、最終的に廃棄物をゼロにするゼロ・エミッションを目指し循環型社会の構築を図っている。1997 年国の「エコタウンプラン」第一号として選ばれた。見学したのは次の 6 リサイクル施設、2 大学研究施設と 1 環境博物館であった。出発前に、学生は 8 施設より各々 1 施設を選び、大学に戻り学んだ事を発表することとした。

We went to Kitakyushu Eco-Town and Environmental Museum on Feb. 28th and Mar. 1st as a FOLENS Feb. Seminar. 7students and 4 staffs were participated. Kitakyushu Eco-Town Project are aiming Zero Emission and recycling society at the end with various waste utilizing for other industrial field. This Eco-Town was chosen for the first Eco-Town Plan by Japanese Government in 1997. We visited 6 recycling facilities, 2 universities Lab. and 1 environmental museum as below. Each students chosen one topic from 8 facilities beforehand and should give their presentation after returning back to TUAT.

(米田健一/Kenichi Yoneda)

テーマ/ Theme	持続可能な農業～藤野パーマカルチャー・センター・ジャパン訪問 / Sustainable Agriculture – Visit to Fujino Permaculture Center Japan (PCCJ)
日時/ Date	2013 年 3 月 22 日（金）/ March 22, 2013, 10:00-16:00
場所/ Venue	藤野パーマカルチャー・センター・ジャパン/ Fujino Permaculture Center Japan (PCCJ)
参加者/ Participants	学生 10 名、教員 2 名 / 10 students & 2 faculty members
プログラム/ Program	· 講義「パーマカルチャーとは」：設楽清和氏（PCCJ） · 農場見学 · Lecture “Introduction to Permaculture”: Mr. Kiyokazu Shidara, PCCJ · Visit to the Farm

古民家を活用した藤野パーマカルチャー・センター・ジャパン（PCCJ）の事務所
An old farm house used as an office of Fujino Permaculture Center Japan (PCCJ)

PCCJ の設楽清和さんによる講義
Lecture by Mr. Kiyokazu Shidara of PCCJ

竹林を抜けて畑へ
Walking through a bamboo grove to the farm

通常の畑とは様子が全く異なるパーマカルチャー農園
Visiting a permaculture farm - very different from conventional farms

ニワトリを小屋ごと動かしながら土を肥やす「チキントラクター」
A “chicken tractor” to fertilize soil shifting a chicken cage

土を覆う草にも意味がある
Farm soil covered with weeds – permaculture style

大学キャンパス内で野菜や蕎麦等を育てる FOLENS ファームでの活動を始めて丸 1 年が経った 2013 年度末、持続可能な農業について実践者から学び、今後の自分たちの活動に生かすため、大学から車で 1 時間あまりの藤野パーマカルチャー・センター・ジャパン（PCCJ）を訪問しました。日本における代表的なパーマカルチャー実践者として知られる PCCJ の設楽清和さんに案内していただきました。PCCJ の事務所となっている落ち着いた古民家で、背景にある生き方・暮らし方としてのパーマカルチャーという考え方につい

てお話しいただいた後、いよいよ農場へ。一般的な畑とは異なり、畝がなく、地面は草で覆われ、様々な作物がその合間から顔を出す様子に学生らは怪訝な顔をしながらも、設楽さんに促されて土に指を入れてその柔らかさに驚き、雑草や畑のデザイン、「チキントラクター」に入れられたニワトリ、畑の片隅に立てられた倉庫や建物など、全てに意味があることを聞き感心した様子。歩きながら、パーマカルチャーが農業として自立可能なのかという質問が出ましたが、設楽さんの解説やご自身の暮らし方から、特定の作物を数多く収穫するという意味での生産性では通常の農業に比べて劣るが、パーマカルチャーは農法というよりも暮らしの様々な要素を自然と調和させ循環させながら農業以外にも様々な活動を通して生きるという生き方そのものであり、様々な作物を育て食べることもその一部なのだと理解でき、「持続可能な農業」とは何か、改めて考えさせられました。

To reflect on our FOLENS farm activities on campus during the first year and to plan our activities for the next season, ten FOLENS students with two faculty members visited Fujino Permaculture Center Japan (PCCJ). PCCJ, located about an hour away by car from the TUAT campus, is headed by Mr. Kiyokazu Shidara, known as one of the leading permaculturists in Japan. After listening to his lecture on the concept of permaculture as a way of living in an old cozy farm house that serves as a PCCJ office, we walked through a bamboo grove to the PCCJ farm. The students were first puzzled with the appearance of the farm totally different from conventional farms in Japan – there was no ridge, soil was covered with weeds, and a variety of crops were growing among them. But as Mr. Shidara guided them to put their fingers in the soil, they were surprised to find how soft it was. His explanation about the meanings of each factor in the farm such as weeds, the design of beds, a “chicken tractor”, and a hut also delighted the participants. While walking in the farm, some of the participants raised a question on the feasibility of permaculture farming as agriculture. According to Mr. Shidara’s explanation and his way of living, we understood that premaculture is not a favorable way of farming if to produce a large quantity of particular crops, however, it is a way of sustainable living to harmonize aspects of life with nature, and farming is part of various activities within such life. This visit gave us a precious opportunity to think once again the meaning of “sustainable farming.”

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

2013 年度 / Academic Year 2013

テーマ/ Theme	FOLENS セミナーへのいざない～2012 年度のふりかえりと 2013 年度の活動計画 / Introduction to FOLENS Seminar – Reflection on 2012 and Planning for 2013
日時/ Date	2013 年 5 月 13 日（月）/ May 13, 2013
場所/ Venue	府中キャンパス / Fuchu Campus
参加者/ Participants	学生 25 名・教員 4 名 / 25 students & 4 faculty members
プログラム/ Program	・昨年度の活動ふりかえり（二ノ宮） ・各学生の関心の発表＆チームづくり ・チームディスカッション～2013 年度活動のアイディア - Reflection on the activities in 2012 (Sachi Ninomiya-Lim) - Sharing of interests and formation of teams - Group discussion: Ideas for the activities in 2013

スライドで去年一年間の活動をふりかえる
Reflected on the activities during the last year with slides

15 名の新入生を含む 25 名の学生が参加
25 students participated including 15 new comers

テーマごとにチームをつくり今年の活動について話し合い
Shared ideas on activities in 2013 in teams formed according to the themes of interest

今年度初めての FOLENS セミナー。学生 25 名（うち新入生 15 名）が参加しました。学生の主体的参画を進めるため、今年も学生自身による活動計画づくりにとりかかりました。昨年度の活動について、写真を見ながら、参加した学生の説明も交えつつふりかえった後、皆で円になり、各学生が「最も関心のあるテーマ」を発表。関心の近そうな学生同士が集まりチームをつくったら、模造紙を囲んでわいわいとアイディア出し。さて、ここからどんな活動計画ができるでしょうか。関心が近いとは言っても、専門分野も文化も言葉も多様な学生同士が話し合い合意に至るまでの道のりは簡単ではありません。6 月セミナーで行う計画プレゼンテーションへ向けて、各チームが話し合いを進めていきます。

Twenty five students (including fifteen new comers) joined the first FOLENS seminar in the academic year 2013. To promote students' initiative, the first activity of the year is, as usual, development of the annual activity plan by students themselves. First, we reflected on what we have done during the last year with photos and comments by students who participated in each of such activities. After that, everyone created a large circle and each presented "what I am most interested in" to find out which students shared similar interest to form a team. After five teams were formed – Water, Organic Farming, Energy/Waste Management, Air Pollution, Practical Application of Environmental Conservation – each team had a discussion to share ideas for the activities this year. Even though the members of each

team have close interests, with such diversity of their backgrounds, cultures and specialties, it is not a simple task for them to put all the ideas together into one concrete plan. The results would be presented in the next seminar.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	藤枝農山村実習/ Field Trip to Fujieda – a Rural Community
日時/ Date	2013 年 6 月 15 日～16 日/June 15th and 16th, 2013
場所/ Venue	静岡県藤枝市/ Fujieda city, Shizuoka Prefecture
参加者/ Participants	学生、教員　全 25 名/ 25 members including students and faculty
プログラム/ Program	・お茶畑見学/Visitation organic tea field ・有機無農薬栽培/Organic agricultural plantation

BBQ パーティ/BBQ Party

記念撮影/Commemorative photo

茶畑見学/Looked around organic tea field

6 月 15.16 日、FOLENS としては今年で 4 回目の参加となる藤枝農山村実習に行ってきました。参加者は FOLENS 学生、国際環境農学専攻の学生、教員等 25 名。藤枝では、例年どおり、有機無農薬お茶栽培を営まれている杵塚さんが温かく迎え入れて下さいました。初日は晴れ、杵柄さんが収穫された野菜や特製の枝豆など、昼食をいただいた後、山の頂部にある杵塚さんが栽培するお茶畑を見学しました。有機無農薬栽培や有機農家の歴史ついてご説明頂き、農薬・化学肥料を一切使わずに栽培されている杵柄さんの農業へのこだわり、熱い思いを感じました。また杵塚さんの後継者である娘さんの「探していた目標は身近にあった」という言葉が印象的でした。その日の夜の BBQ パーティで地域の方や日本の有機栽培について学びに来ているボランティアの方々と交流し、現在の農家の現状を聞く貴重な機会を得ました。翌日の朝は、あいにくの小雨の中、田植えを行いました。田植え後、地域の方も参加してグループ別に議論を行い、有機農業、食の安全等グループ毎に異なるテーマで意見を交換、発表し、質疑応答では活発な議論が展開されました。今年もまた「藤枝スクール」は、自ら感じ実践し、各個人が現代社会に於いて自分の役割を考え行動することの大切さを改めて認識できる貴重な機会を提供してくれました。

On June 15-16, we had a Field Trip to a rural community of Fujieda, to join so called “Fujieda School”. This is the fourth year for FOLENS to join the School. We had a participation of 25 people including FOLENS students, IEAS (Department of International Environmental and Agricultural Science) students and faculty members. In Fujieda, we received a warm hospitality of Kinezuka family, organic farm owner this year again. Fortunately it was sunny on the first day. After having lunch with rice and vegetables including special soy beans (edamame) cropped by Kinezuka farm, we went up the hill and visited the tea farm. Mr. Kinezuka kindly explained agricultural method and history of organic farming. He enthusiastically talked about his concern and loyalty to organic farming without using any agricultural chemicals. Ayumi, a daughter of Mr. Kinezuka sent an impressive message as well – “I had not noticed my goal in my life even though it was very close to me. Finally I found the answer was right under my nose.” In the evening we had a special BBQ party, where we had valuable time to exchange our thoughts and opinions with local

people and volunteers, who came to learn about organic lifestyle in Japan. It was raining on the next morning but we experienced rice planting. After rice planting, students together with other local participants were divided into small groups to discuss and exchange opinions and thoughts regarding some of the common themes in relation to agriculture. Each group presented their discussions on a variety of themes including organic agriculture and food safety. In Q&A session, eager discussions were exchanged.　This “Fujieda School” is a valuable opportunity to feel and practice under the theme of “Food and Agriculture” and learn the importance to play a role of each individual in our society.

（杉山智恵子、米田健一/Chieko Sugiyama, Kenichi Yoneda）

テーマ/ Theme	チーム活動計画発表 / Presentation of Team Activity Proposal
日時/ Date	2013 年 6 月 26 日 / June 26, 2013
場所/ Venue	小金井キャンパス / Koganei Campus
参加者/ Participants	学生 23 名・教員 4 名　/ 23 students & 4 faculty members
プログラム/ Program	FOLENS セミナー活動計画発表 / Presentation of FOLENS Seminar Activity Proposals

学生の関心分野ごとに 5 チーム（エネルギー・廃棄物管理／水／有機農業／大気汚染／自然環境保全）に分かれて策定してきた、2013 年度の FOLENS セミナー活動計画について、まず 3 チームが発表しました。各テーマの背景と活動をわかりやすく説明して、計画を理解してもらうことが大切です。各発表のあとには、さらに計画を改善し具体化するための意見交換を行いました。各テーマに関して情報収集するだけでなく、取組みや対策など様々な角度から課題を考え、環境問題解決にむけて的を絞り具体的に計画を策定することが大切だという指摘がなされました。後期の実行へ向けて、チームごとに計画・予算を具体化していきます。

This year, FOLENS students have been divided into five teams (Energy & Waste Management/ Water/ Organic Farming/ Air Pollution/ Nature Conservation) according to their interests to develop and implement their own FOLENS seminar activities. In this seminar, three of them presented their team activity proposal. Their task was to explain the background of the targeted theme and issues, and their activity plan in an accurate and understandable manner. The Q&A session followed each presentation, and enthusiastic discussions were exchanged. It was emphasized for each team that it is important to not only gather information but also consider various aspects including current issues and possible measures to clarify the focus and specify their activities. The students would finalize their team activity plans with specified schedule and budget for the implementation in the fall term.

（杉山智恵子/ Chieko Sugiyama）

テーマ/ Theme	タイ実習プレゼンテーション/Thailand oversea field training presentation
日時/ Date	2013 年 7 月 12 日/July 12th, 2013
場所/ Venue	府中 2 号館多目的室 / Multipurpose Room, 2nd Building, Fuchu
参加者/ Participants	学生 42 名 教員 3 名/42 students and 3 faculty members
プログラム/ Program	1. 下水処理場からの温室効果ガス測定と低減策検討 / Measuring the Green House Gas from sewage treatment plant and considering its reduction. 2. タイ廃棄物処理に関する比較調査/ Comparative survey of Thailand municipal solid waste management 3. ガソリン添加用バイオエタノールから水素製造/ Hydrogen production from gasoline adding bio-ethanol 4. ペーパレス社会に向けたタイ語認識システム構築/ Development of handwritten Thai language recognition system for paperless society 5. ごみ処分場でメタンガス分布をレーザーで測定/ Measurement of methane gas distribution with laser in landfill

タイ実習プレゼンテーション（栄　康）/ Thailand oversea field training presentation(Song Kang)

7 月 12 日の FOLENS セミナーで 7 月 27 日からのタイ実習に参加する 9 名の学生が、学生 30 名と職員数名にプロポーザルを次の点を中心に発表した。(発表者)

1. 下水処理場からの GHG（温室効果ガス）測定と低減策検討

① N_2O サンプリング後、研究室に持ち帰り自分で分析（Song Kang）

② メタン、二酸化炭素をカセサート大学で分析して結果を考察 (Tang Si Hiep）

③ 微生物に焦点を合わせて研究(志村)

④ アンモニア酸化菌の研究(Bao Qian)

⑤ レーザー計でメタンを田園、下水処理場、処分場で計測（梅津）

2. タイ廃棄物処理に関する比較調査 (Harakhun Tanatavikorn)

3. ガソリン添加用バイオエタノールから水素製造（八百）

4. ペーパレス社会に向けたタイ語認識システム構築（松下）

5. ごみ処分場でメタンガス分布をレーザーで測定（竹村）

FOLENS 学生と教員から多数の質問とコメントを受け、参加する学生はそれに応え、実習の準備を充実させた。

9 FOLENS students going to Thailand from July 27 as an oversea training gave their presentation focusing on the next item to 30 FOLENS students and 3 staffs on July 12, FOLENS July Seminar. (Student presented)

1. Measuring the GHG (Green House Gas) from sewage treatment plant and considering its reduction.
2. ① Sampling and analyzing the N_2O gas in his laboratory. (Song Kang)
3. ② Sampling, analyzing the CH_4 and CO_2 at Kasetsart Univ. and evaluating(Tang Si Hiep)
4. ③ Study focusing on microorganisms(Fumi Shimura)
5. ④ Study about the quantity of ammonia-oxidizing-bacteria(Bao Qian)
6. ⑤ Measuring the CH_4 from the rice field, sewage treatment and landfill with laser meter(Saori Umetsu)
7. Comparative survey of Thailand municipal solid waste management (Harakhun Tanatavikorn)

8. Hydrogen production from gasoline adding bio-ethanol (Takami Yao)
9. Development of handwritten Thai language recognition system for paperless society(Tomohisa Matsusita)
10. Measurement of methane gas distribution with laser in landfill (Ryuichi Takemura)

They received many questions and comments from the students and staffs, answered questions and enriched their training preparations.

(米田健一/Kenichi Yoneda)

テーマ/ Theme	檜原村湯久保地区獅子舞奉納 Lion Dance Ceremony in Yukubo, Hinohara Village
日時/ Date	2013 年 8 月 31 日（土）/ August 31, 2013
場所/ Venue	東京都檜原村 Hinohara, Tokyo
参加者/ Participants	学生 7 名・教員 3 名 / 7 students & 3 faculty members
プログラム/ Program	獅子舞奉納の見学・農山村地域の暮らし体験 / Experience of the traditional lion dance ceremony & rural life

東京の西端、奥多摩の山中、檜原村湯久保地区を訪れ、当地に伝わる獅子舞奉納を見学・体験しました。湯久保地区の獅子舞への農工大生の参加は、本学農学部　朝岡幸彦教授により始められ、地域の伝統文化継承に対する支援と、持続可能な地域社会のあり方に関する学習・研究を目的するものです。今回は、FOLENS の留学生が 4 名と、FOLENS 外の学生 3 名（うち留学生 2 名）が参加し、うち 3 名は実際に舞やささら（竹で作られた伝統的打楽器）の特訓を積み本番に臨みました。急な山道を登った先に位置する当地区の幻想的な雰囲気を満喫し、周辺地域を歩いて山村の暮らしや周囲の地形を学び、持続可能な地域づくりへ向け様々な活動を展開する地元住民の方々と交流し、獅子舞奉納には加わらなかった学生も含め、貴重な時間を過ごしました。

Yukubo District of Hinohara Village is located at a western edge of Tokyo, surrounded by mountains of Okutama. We visited this district to study and experience the traditional Lion Dance Ceremony inherited in the community. The participation of TUAT students to the ceremony has been organized by Prof. Yukihiko Asaoka of Agricultural Faculty for some years, in order to support the rural community in Tokyo to inherit its tradition and also to learn from the people's activities for sustainable rural community development. This year, four FOLENS international students and three non-FOLENS students (of which two were international students) joined the event and three of them actually joined the dance, after tough training for a month. The students, including those who did not join the dance, had a precious time while experiencing the tradition of a Japanese rural community, studying a landscape of rural areas of Tokyo, communicating with people challenging to build a sustainable rural community, and thinking about the ideas and issues of sustainable community development.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	富士山麓実習/ Field Trip to Fujisan
日時/ Date	2013 年 10 月 17 日～18 日/October 17th and 18th, 2013
場所/ Venue	富士山麓/The piedmont of Mt. Fuji
参加者/ Participants	FOLENS 生 15 名、IEAS22 名、教員 4 名/15 FOLENS students, 22 IEAS students, 4 faculty
プログラム/ Program	世界文化遺産に登録された富士山の周辺の文化と自然環境の管理とそれらの保全/The culture around Mt. Fuji registered as the world cultural heritage, management of natural environment and its conservation



2013 年 10 月 17-18 日、国際環境農学専攻と合同でフィールド実習に行きました。実習では、世界文化遺産に登録された富士山の周辺の文化と自然環境の管理とそれらの保全について学ぶことを目的としていました。

最初に訪れたのが、山梨県富士吉田市にある、環境省自然環境局生物多様性センターでした。センターでは、業務の説明を受け、併設されている展示室を見学しました。このセンターで発信される自然環境や生物多様性に関する情報は、様々な分野で役立てられていることを学びました。

午後には同じく富士吉田市にある、富士山レーダードーム館と富士吉田市歴史民俗博物館を訪れました。富士山レーダードームには、1965 年に設立され富士山頂で 35 年間気象観測を行っていたレーダーが展示されていました。天気予報や災害の防止に寄与した。このような高地にレーダーを設置する難しさ、そして彼らはその困難をどのように克服したかを学びました。富士山レーダーは日本の気象観測の象徴であります。また富士吉田歴史民俗博物館では、世界文化遺産に登録された富士山との関わりの中で形成された独自の文化を学ぶことができました。

2 日目の朝、フォレストアドベンチャー富士を訪れ、自然共生型パークにおいて、実際に体験しながら環境教育を学習しました。午後には西湖いやしの里根場を訪れ、富士山周辺における環境管理と自然災害防止について学びました。

世界遺産に登録され、新たに注目を集める富士山ですが、それを取り巻く環境や異なる視点から学ぶことで、富士山を再び見つめなおすよい機会になったと思います。

17th and 18th October 2013: FOLENS Seminar

On 17-18 October, we had a field trip together with IEAS. The purpose of this trip was to learn the culture around Mt. Fuji registered as the world cultural heritage, the management of natural environment and its conservation.

On the first day, we visited The Biodiversity Center, Nature Conservation Bureau, Ministry of the Environment, Japan. This center is located in Fujiyoshida city, Yamanashi prefecture. A person worked in this center introduced the purpose of this center to us. And we visited exhibition room established together with this center. We learned the information about the natural environment and biodiversity The Biodiversity Center of Japan supplying is used in a variety of fields.

In the afternoon of first day, we visited "Mt.Fuji radar dome museum" and "Fujiyoshida museum of local history". This radar was established in 1964 at the top of Mt.Fuji, and had been working for 35 years, contributing to disaster prevention or weather observation. I learned that it was difficult to establish the radar at a high place and how they overcame the difficulties and obstacles. This radar is known as a symbol of weather observation in Japan. In Fujiyoshida museum of local history we learned the unique culture that was formed and closely associated with Mt.Fuji registered as a world cultural heritage.

In the morning of second day, we visited "Forest adventure Mt.Fuji and learned environmental education of natural symbiosis park through our activities. In the afternoon of second day, we visited "Saiko Iyashi no Sato NENBA". We learned environmental management and natural disaster mitigations around Mt. Fuji.

While Mt. Fuji is registered as the world cultural heritage and now having new attention, we had a good opportunity to reconsider Mt.Fuji from learning its surrounding environment and different view points

(小畑雄司(FOLENS 学生)/Yuji Kobata(FOLENS students))

テーマ/ Theme	せせらぎ農園訪問（有機農業チーム活動）/ Visit to Seseragi Farm (Organic Farming Team Activity)
日時/ Date	2013 年 10 月 22 日 / October 22, 2013
場所/ Venue	せせらぎ農園 / Seseragi Farm
参加者/ Participants	学生 4 名 / 4 students
プログラム/ Program	有機農業実習 / Training of organic farming

生ごみを土にかき混ぜている
Mix garbage and soil

生ごみを投入して 1 ヶ月程度たった土
1 month after the garbage mixing

地域から回収してきた生ごみを畑に投入
Putting garbage in soil

農園に作業をしに来た幼稚園生
Kindergarteners harvesting potatoes

Folens セミナー・有機農業チームの活動として、有機農業について知るために、せせらぎ農園を訪問しました。せせらぎ農園は東京都日野市にあるコミュニティーガーデンです。ここでは約 200 世帯の生ごみを回収し、直接土ごと発酵という方法により土づくりを行い、無農薬、無化学肥料で野菜や花を育てています。我々学生はせせらぎ農園で活動を行っている佐藤さんにせせらぎ農場と有機農業について教えていただきました。また、農場や実際に回収してきた生ごみを土に入れ、土づくりをしているところを見せてもらいました。生ごみを入れてから 1 週間で生ごみの形は無くなり、約 1 ヶ月後には完熟し、使える状態になります。生ごみを分解する土壌菌の働きを助けるために、土の水分率を土にブルーシートや草をかぶせることによる調節や、定期的に菌に酸素を与えるために土のかき混ぜを行っています。この活動を 3 年続けて、土が軟らかく、ふかふかになったとおっしゃっていました。有機農業では農薬を使わないので、虫が葉について虫食

いができるなどの被害が出るそうです。虫がついた時でも化学系農薬は使わず、木酢を吹きかけたり、人海戦術で虫を取り除くということを行っています。虫が来ないくらい元気な野菜を作ること目指しているそうです。

もともとはゴミ問題を解決するために、生ごみを牧場で堆肥にすることから始まり、その後、牧場で処理をできなくなった事をきっかけに、せせらぎ農園で有機農業を始めたそうです。せせらぎ農園には当番や会費などはなく、活動したい人が子供、親子、お年寄りなど多様な人々が各々作業したいときに集まって作業をしており、市民の居場所となっています。私たちが訪れた際にも幼稚園生が作業をしに農園を訪れていました。

有機農業は化学系肥料や農薬を使った農業に比べると手間がかかり、収量も少なくなるといった問題点がありました。しかし、せせらぎ農園さんでは作業している人が食べるだけの作物を作り、皆さんで楽しんで農作業をされていました。規模としては小さいですが、その地にある生ゴミを利用して堆肥にし、生産した野菜を作業している人で消費するという地産地消をしており、有機農業を続けていける良い形態になっていると感じました。

As a FOLENS group activity, members of the organic farming group visited the “Seseragi Farm”. The farm is the community garden in Hino city, Tokyo. The farm collects food wastes from 200 houses and uses them as compost to make vegetables and flowers without using pesticides or chemical fertilizers. Ms. Sato, the representative of the farm, taught us about the activity of the farm and organic farming. In the farm, we saw how they mix garbage into soil. Garbage will be fermented gradually and disappears in a week and after a month, soil is ready to use. To activate soil bacteria, which ferment garbage, the moisture content of soil is controlled by the blue sheet cover or grass cover and soil is mixed periodically to give oxygen to bacteria. 3 years has passed since Ms. Sato started the farm activity. She said the 3 years activity made soil very soft. Though farm products are damaged by disease and harmful insects, pesticides are not used and volunteers work hard to take away worms by their hands. The farm aim to make fresh and strong vegetables that can keep away pests.

The activity of “Seseragi Farm” started in the stock farm originally. They started to make compost from garbage in the stock farm, but after few months the stock farm closed and they got a land in this place. The farm is managed by volunteers. There are no duty or membership fees. Who wants to work in the farm comes here whenever he like. Children, families, old men and so on. Many people gather for refreshment.

Compared with a chemical using farming, an organic farming is laborious and less yielding. However, the people in the “Seseragi Farm” produce vegetables as much as they can eat and enjoying the work in the farm. The size of the farm is not so big, but they are making the ecological cycle in that local area. We thought the “Seseragi Farm” could be a good model of a continuous organic farming.

（梅津沙緒里（FOLENS 学生）/ Saori Umetsu (FOLENS student)）

テーマ/ Theme	佐渡島実習事前セミナー・せせらぎ農園訪問レポート・ 環境リーダー修了生ネットワーキング学生会合レポート・10 月新入生歓迎会/ Introduction to FOLENS Seminar – Reflection on 2012 and Planning for 2013
日時/ Date	2013 年 12 月 6 日（月）/ December 6, 2013, 16:20-18:00
場所/ Venue	府中キャンパス / Fuchu Campus
参加者/ Participants	学生 24 名・教員 3 名 / 24 students & 3 faculty/staff members
プログラム/ Program	・せせらぎ農園訪問レポート（有機農業チーム） ・環境リーダー修了生ネットワーキングへ向けた学生会合@北海道大学レポート ・佐渡島実習（12/8-10）概要 ・10 月新入生歓迎会 - Report of Seseragi Community Farm by Organic Farming Team - Report of First Sustainability Environmental Leader Summit - Overview of Sadogashima Island Visit -Presentations by Environmental Conservation Team - FOLENS New Students Welcome Party

後期に入って初めての座学型 FOLENS セミナーは、この間実施された様々な活動報告と、次週に予定している佐渡島での生物多様性保全と農業をテーマにした実習の事前学習、さらに 10 月より FOLENS に新しく加わった学生 2 名の歓迎会と、盛りだくさんの内容となりました。

The first FOLENS Seminar in this term was organized on 6 December with a variety of contents: a report of a visit to a community organic farm by Organic Farming Team, a report of First Sustainability Environmental Leader Summit, and an orientation for Sadogashima visit in the following week. The seminar was followed by a welcome party for two new students who joined FOLENS in this October.

（二ノ宮リムさち/ Sachi Ninomiya-Lim）

テーマ/ Theme	トキを中心とした生物多様性保全と農業～佐渡島訪問 /Environmental and Wildlife Conservation in Sadogashima Island (Environmental Conservation Team)
日時/ Date	2013 年 12 月 9～10 日/ December 9-10, 2013
場所/ Venue	新潟県佐渡島/ Sado island, Niigata Pref.
参加者/ Participants	学生 20 名・教員 2 名/ 20 students & 2 faculty members
プログラム/ Program	概要/Overview 12 月 9 日/ Dec.9 9:00　佐渡島両津港到着/ Arrive at Ryotsu Port Sado Island 環境省佐渡トキ保護センター/ Toki reintroduction center Ministry of Environment 生物多様性保全型の水田を見学 /Visit paddy of biodiversity conservation スーパーマーケットで買い物、昼食 /Shopping at a local supermarket and lunch 小倉千枚田、岩首の棚田訪問 / Rice terraces in Ogura and Iwaku トキ交流会館宿泊 / Stay at “Toki koryu kaikan” ワークショップ と懇親会/ Workshop and party 12 月 10 日/ Dec.10 当初は生椿・清水平地区やトキの森公園の訪問を予定していたが、天候悪化によりフェリー欠航が予想され、繰り上げて帰京した。/ Originally we have planned to visit “Haetsubaki” and “SHimizudaira”. Because of a storm, cancel of ferry was expected and returned earlier.

佐渡トキ保護センター「野生復帰ステーション」見学/ Learning the activities of Toki Reintroduction Center

「順化ケージ」を見学/ Facility to reintroduce Toki to the wildlife

生物多様性保全型の水田を見学し説明を受ける/ Field observation eco-friendly agricultural system in paddy field

田園風景を飛んでいる野生復帰したトキ/ Reintroduced Toki flying in the local landscape

小倉千枚田。自然保護と観光地の観点から再建された。/ Rice terrace in Ogura. The paddy field has been reconstructed to preserve the nature and provide tourism spot.

岩首の棚田. 山並み、棚田、日本海という美しい風景がエコツーリズムを実現させている。/ Rice terrace in Iwakubi. The beautiful scenery of preserved nature, paddy fields and sea view makes this a very promising location for eco-tourism.

養老の滝。佐渡の人々にとって文化的・歴史的に大切な場所でもある。/ Yoro waterfall. Beautiful waterfall that also have cultural importance for Sado's people.

実習の参加者とガイドの中島さん(一番右)/ Participants of the field trip and local guide Nakajima san (at the most right)

12 月 9 日～10 日にかけて、佐渡島を訪問しました。

佐渡島は平成 23 年に GIAHS―Globally Important Agricultural Heritage Systems に登録され、トキを中心として生物多様性を守り、伝統的な農業や文化を維持する地域として認められました。私たちのグループではこのことに関心を抱き、佐渡島、トキ、生物多様性、伝統的な農業についてなどを調べ、実習当日には実際にその現場を直接訪れて NPO や地域のガイドの方々にお話をうかがうことができました。

訪れた場所

野生復帰ステーション

屋内で環境省の方の説明をうかがった後、トキが放鳥されるまでに餌の獲り方などを学ぶ施設を見学しました。

単なる飼育・繁殖とは異なる「野生復帰」ということの難しさについて考えさせられました。

野生復帰ステーションからの道中、幸運にも野生復帰を果たしたトキ 6 羽と遭遇できました。飛んでいる姿がまさに「朱鷺色」をしていて、田園風景と共に目に焼きつきました。

生物多様性保全型の水田

トキを中心とした生態系の生物多様性に配慮し、水田には魚道やため池があり、冬場も水を張るなどの取り組みがされていました。

小倉千枚田

初めて「棚田」を目にし、斜面から段になって続く水田に驚きました。

見た目はきれいでしたが実際に登ってみると、登り降りをしながら農作業をする苦労を想像せざるを得ませんでした。

岩首の棚田

最初に案内していただいた「養老の滝」は空気がとてもおいしく、ここの水が米作りにとって重要な資源であるというガイドの方のお話にも納得でした。

大規模に連なっている棚田では、200 年前から続いているという田園とそのむこうに見える海という景色を見ることができました。

得られたもの

今回の実習でいくつかの場所を訪れてお話を聞くことで、それまで机上の知識だった環境の問題について現場の人々の生の声に触れることや自分自身の目でその場所を見るということができました。

佐渡のトキと農業に関する取組みは、行政によるトキ自体の保護と野生復帰、米農家の方々によるトキと共に歩む農業のための努力、佐渡の伝統的農業を、生物多様性を維持し未来へ受け継ぐべき文化として発信すること(岩首の棚田のガイドの方は数日後に東京で開催されるエコプロダクツに出展されたそうです)…と、様々な角度から相互に繋がっているというのが実感としてよく分かりました。

農工大へと戻ってきた私たちがすべきことは、佐渡の経験をもとに視野を広げ、他の地域での問題と共に考え、自分の中で生かしてゆくことではないかと思います。 現地の方々、先生方、参加者の方々にお世話になり、今回の実習という貴重な機会を実現できたことにグループのメンバー一同感謝しております。

（FOLENS 学生グループ「環境保護への具体的アプローチ」
Hanhan, Mizuki, Rahman, Yoshie）

プログラム

前日の夜 (12 月 8 日)

23:00　JR 新宿駅の南口に集合

23:59　夜行バスで新宿を出発

1 日目(12 月 9 日)

5:45　新潟駅に到着

7:55　新潟港からジェットフォイルに乗船

9:00　佐渡島の両津港に到着し、ガイドの中島さんと合流

10:00　トキ保護センターの「野生復帰ステーション」を訪問

11:30　生物多様性保全型の水田を見学

12:30　地元のスーパーマーケットで買い物の後、昼食

14:30　小倉千枚田を訪問

16:00　岩首の棚田を訪問

18:00　宿泊先(トキ交流会館)に到着

18:30　新穂温泉に行き、夕食

20:00　一日の経験をふりかえるワークショップ

2 日目（12 月 10 日）

7:00 朝食

8:40 トキ交流会館を出発

9:15 両津港からフェリーに乗船

11:45 新潟港に到着

12:15 解散

※当初は 2 日目に生椿・清水平地区やトキの森公園への訪問を予定していたが、当日、天候悪化によりフェリー欠航が予想されたため、中止となった。

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12 月 9-10 日に佐渡島を訪問しました。これは、トキの野生復帰と保護を主要なテーマとして、学生有志が主体となって企画した野外実習（FOLENS セミナー）でした。活動は、トキの野生復帰のための環境省施設の見学と島内における各種の取り組みを見学することがメインでした。しかし、棚田や伝統的農法の維持の苦労、輸入個体をもとにした野生復帰に関する賛否、それらによる生物多様性保全の在り方、エコツーリズムとの共存など、視点を広げて学ぶ機会となりました。これら訪問の途中、実際に野生のトキを見ることができました。2 日目は天候悪化の影響で、予定を繰り上げ朝から新潟に戻ることになりましたが、充実したセミナーでした。最後に、現地でお世話になった新潟 NPO 協会の皆様、宿泊したトキ交流会館にお礼申し上げます。

We visited Sado Island during 9~10 December 2013.

Sado Island was selected by GIAHS-Globally Important Agricultural Heritage Systems-as a site that conserves biodiversity with a focus on Japanese crested ibises (Toki in Japanese) and maintains traditional agriculture and culture in 2011. We became interested in this area and studied about Sado Island, Japanese crested ibises, biodiversity and

traditional agriculture. On the day of field trip, we could visit the site and listened to people working for NPOs and local guides.

Places where we visited

Reintroduction Ccenter

After we received explanation about the reintroduction of Japanese crested ibises, we observed the facility to let ibises to learn how to catch their baits.

There made us think about difficulty of reintroduction (it's not simple keeping).

On our way from the Reintroduction Center, we luckily could see 6 ibises reintroduced to wild. Their unique color called "Toki color" was so beautiful and impressive when they were flying in local landscape.

E-type agricultural system in rice paddy field

We saw rice paddy fields with consideration for the environmen and biodiversity.

For example, there were fish passages and ponds, and paddies were filled with water even in winter for ibises to get baits to avoid hunger.

Rice terrace in Ogura

We surprised at a view of step-wise rice terraces.

The landscape was beautiful, but it was hard to ascent and descent.

We could only imagine toil of farming there.

Rice terrace in Iwakubi

We could breathe very fresh air in "Yoro Waterfall"., The local guide's story that the water from this waterfall is important for rice farming was convincing.

We saw the landscape composed of a series of rice terraces, where people have produced rice over 200 years and sea in the distance.

Result of this field trip

Through this field trip, we could listen to real voices of local people in Sado and know things about environmental issues which we could no't get on armchairs.

We could understand that efforts for Japanese crested ibises and agriculture by people in Sado Island were intricately linked with each other. For example, the Conservation and reintroduction of Japanese crested ibises, the improvement of agriculture for maintaining the symbiosis with ibises, the promotion of traditional agriculture in Sado as a culture which can maintain biodiversity and what should be sustained for the future.

What we should do after coming back to TUAT is broadening our horizon by experience in Sado and comparing between Sado and other regionsm and applying this experience in our life.

All of us in the management group are grateful for help by people in Sado, faculty and students in FOLENS and realization of this valuable chance.

(FOLENS Students Group "Practical Approach towards Environmental Conservation"group
Hanhan, Mizuki, Rahman, Yoshie **)**

Program:

The night before(8 December)

23:00 Meet at JR Shinjuku station(South exit)

23:59 Take a night bus at Shinjuku

Day1 (9 December)

5:45 Arrive at Niigata station

7:55 Get on board a ship at Niigata port

9:00 Arrive at Sadogashima(Ryoutsu port)

Meet Mr. Nakajima who is this trip conductor

10:00 Visit Toki reintroduction center

11:30 See E-type rice paddy field

12:30 Go shopping in Local supermarket and have a lunch

14:30 Visit Rice terraces (Tanada) in Ogura

16:00 Visit Rice terraces in Iwakubi

18:00 Arrive at Accommodation (Toki koryu kaikan)

18:30 Dinner and taking a bath at Niiho katagami onsen (hotspring facility)

20:00 Workshop about experiences in one day

Day2(10 December)

7:00 Have breakfast

8:40 Leave from Toki koryu kaikan

9:15 Get on board a ship at Ryoutsu port

11:45 Arrive at Niigata port

12:15 Department

*The original plan included visits to communities of Haetsubaki and Shimizudaira, and Toki Forest Park on the second day but we canceled them due to the weather condition.

We visited Sado Island as an outdoor field training of FOLENS Seminar on December 9th and10th. The main topic was protection and reintroduction of the ibis, taken care by Niigata NPO Association. The training was started from a visit of Toki reintroduction center, the Ministry of the Environment. Then we learnt efforts of the maintenance of traditional farming and rice terraces. Moreover, this visit gave us opportunity to consider and discuss about efforts of the maintenance of traditional farming methods and terraced rice fields, arguments for the reintroduction of ibis based on imported individuals, biodiversity conservation, and eco-tourism. We saw several wild ibis during the field visit. Due to a weather condition we decided to come back from the morning on the second day but we had a good field seminar. We would express our gratitude to Niigata Association of Nonprofits and the accommodation staff.

（尾崎宏和/Hirokazu Ozaki）

テーマ/ Theme	佐渡島実習事後セミナー/ Report of Sadogashima Trip
日時/ Date	2014 年 1 月 20 日/January 20th, 2014
場所/ Venue	府中キャンパス 2 号館多目的教室/Multi-purpose room, 2nd building, Fuchu
参加者/ Participants	学生 15 名　教員 3 名/15 students and 3 faculty members
プログラム/ Program	－全体のふりかえり 　グループ発表 －「トキの生態」 －「佐渡の農業」 －「地域自然園：コミュニティビオトープ」 －「自然共生型観光：エコツーリズム」 Group Presentation by Sadogashima Field Training Participants - Overall review of the trip - TOKI (Japanese crested ibis) - Agriculture - Community Biotopes - Eco-tourism

実習前に興味別のグループを設定し、佐渡島での学習内容を発表しました。/ Groups were constructed based on interests in advance and their study content was presented

年末の佐渡島訪問では、興味に応じグループをあらかじめ編成し、それぞれの観点で学んできました。グループは、「トキの生態」、「佐渡の農業」、「地域自然園：コミュニティビオトープ」、「自然共生型観光：エコツーリズム」の 4 つで、今回はそれぞれが学習内容を発表しました。また、佐渡訪問本体に参加できなかったメンバーとも実習内容の共有を図りました。これら各テーマは、いずれも生物多様性の維持や保全には大切であり、地域ぐるみの活動が求められることを皆で確認しました。

The visit of Sado Island at the end of last year, we have organized 4 groups in advance and learnt based on interests. The groups were consisted of "TOKI (Japanese crested ibis)", "Agriculture of Sado", "Community biotope", and "Ecotourism". The learning content was shared each other and those who did not join the trip, and even with non-FOLENS students.

We discussed that all the 4 themes are complementarily important for preservation and maintenance of biological diversity and activity in whole region is meaningful.

（尾崎宏和/ Hirokazu Ozaki）

テーマ/ Theme	北九州エコタウンと環境ミュージアム/Kitakyushu Eco-Town and The Environmental Museum
日時/ Date	2014 年 2 月 20～21 日/February 20 and21, 2013
場所/ Venue	北九州エコタウン/Kitakyusyu Eco-Town
参加者/ Participants	学生 10 名　教員名/10 students and 1 faculty
プログラム/ Program	2 月 20 日（木）8：15 羽田空港第一ターミナル 2 階 2 番案内所集合 第一日目：北九州エコタウン事業全体概要説明（Fig.1, 13:30～） 1.廃空き缶をリサイクルしてアルミとスチールの素材を作る(Fig.2) 2.廃木材と廃プラから合成木材とベンチを作る(Fig.3) 3.九州工業大学の生ごみから生分解性プラスチックを合成して、その生分解性プラツチックのリサイクル使用の実証研究 (Fig. 4) 4.福岡大学の廃棄物処分場の研究 (Fig.5) 第二日目 5. 廃 PET ボトルからプラスチックのフレークとペレットを作り、それから帽子、制服等を作る(Fig.6) 6. 廃医療廃棄物からセメントプラントで使う金属、RDF とリサイクルコンテナを作る(Fig. 7) 7. 環境ミュージアムの「地球の道」（倉本聰さん創作）で、地球の歴史と環境を学んだ(Fig. 8, 12:30-13:30) 8. 廃蛍光管の両端を切り蛍光管を砕き、アルミ、蛍光体と水銀を回収 (Fig, 9) 9. 廃コピー機よりプラスチック、アルミと路盤材を作る(Fig.10) Meeting Time: 8:15 Feb. 20th at 2nd Floor information 2nd desk of Haneda airport No.1 Terminal **First Day**：General information of Kitakyushu Eco-Town(Fig.1, 13:30～) 1.Reproduce aluminum and steal from waste can (Fig.2) 2.Reproduce compound board and bench from waste wood and plastic (Fig.3) 3.Practical research on making biodegradable plastic from garbage and its recycle use by Kyusyu Technical Institute (Fig.4) 4.Waste landfill research by Fukuoka University(Fig.5) **Second Day** 5.Reproduce flake and pellet of plastic to make cap and uniform from waste PET bottle (Fig.6) 6.Reproduce metal for cement plant, RDF and recycle container from medical waste (Fig.7) 7.We learned a lot about earth history and environment from Road of the Earth produced by Mr. Satoshi Kuramoto (Fig.8, 12:30-13:30). 8.Reproduce aluminum, fluorescent and mercury from fluorescent tube by cutting the edge and breaking tube (Fig.9) 9.Reproduce plastic, aluminum and roadbed material from copy machine (Fig.10)

Fig.1 北九州エコタウンセンターでの概要説明/ General information of Kitakyushu Eco-Town

Fig.2 廃空き缶をリサイクルしてアルミとスチールの素材を作る/ Reproduce aluminum and steal from waste can

Fig.3 廃木材と廃プラから合成木材とベンチを作る/ Reproduce compound board and bench from waste wood and plastic

Fig.4 北九州工業大学での生ごみから生分解性プラスチック生成プロセスの説明/ Practical research on making biodegradable plastic from garbage and its recycle use by Kyusyu Technical Institute

Fig.5 福岡大学の廃棄物処分場の研究/ Waste landfill research by Fukuoka University

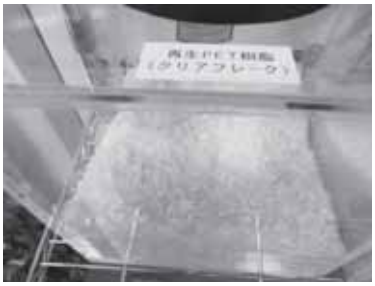

Fig.6 廃 PET ボトルからプラスチックのフレークとペレットを作り、それから帽子、制服等を作る/ Reproduce flake and pellet of plastic to make cap and uniform from waste PET bottle

Fig. 7 医療廃棄物からセメントプラントで使う金属、RDF とリサイクルコンテナを作る/ Reproduce metal for cement plant , RDF and recycle container from medical waste

Fig. 8 環境ミュージアムの「地球の道」（倉本聰さん創作）で、地球の歴史と環境を学んだ/ We learned a lot about earth history and environment from The Road of Earth produced by Mr. Satoshi Kuramoto

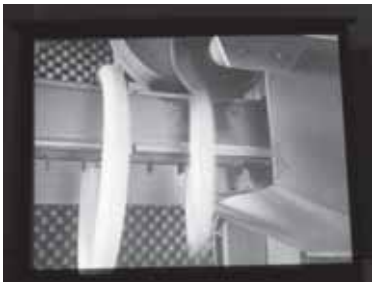

Fig.9 廃蛍光管の両端を切り蛍光管を砕き、アルミ、蛍光体と水銀を回収/ Reproduce aluminum, fluorescent and mercury from fluorescent tube by cutting the edge and breaking tube

Fig.10 廃コピー機よりプラスチック、アルミと路盤材を作る/ Reproduce plastic, aluminum and roadbed material from copy machine

２月の FOLENS セミナーを 2 月 20 日と 21 日北九州エコタウンと環境ミュージアムで学生 10 名、教員 1 名で実施した。

北九州エコタウン事業は、さまざまな廃棄物を他の産業分野で活用し、最終的に廃棄物をゼロにするゼロ・エミッションを目指し循環型社会の構築を図っている。1997 年国の「エコタウンプラン」第一号として選ばれた。見学したのは 6 リサイクル施設、2 大学研究施設と 1 環境博物館であった。

We went to Kitakyushu Eco-Town and Environmental Museum on Feb. 20th and 21st as a FOLENS Feb. Seminar. 10students and 1 staff were participated.

Kitakyushu Eco-Town Project are aiming Zero Emission and recycling society at the end with various waste utilizing for other industrial field.

This Eco-Town was chosen for the first Eco-Town Plan by Japanese Government in 1997.

We visited 6 recycling facilities, 2 universities Lab. and 1 environmental museum as below.

(米田健一/Kenichi Yoneda)

6-9. 国際シンポジウム / International Symposium

6-9-1. 国際シンポジウム概要 / Overview of FOLENS International Symposiums

各年度の国際シンポジウムは、成果の広報の場としてだけでなく、学生教育の場、拠点形成の場、さらにはプログラム運営への理念形成の場として多角的に位置付けて企画し、5 年間次のように実施しました。

- 第 1 回国際シンポジウムは「アジア・アフリカ現場立脚型環境リーダー育成（FOLENS）プログラム発足記念国際シンポジウム」と題し、海外教育研究拠点の協力教員、本学協力教員と事務職員が一堂に会してプログラムの諸情報を共有すると共に、JICA や NGO からのゲストも交えて「環境リーダーに必要な能力と資質」について議論し、プログラム運営の基幹となる体制と理念の整備を行いました。

- 第 2 回国際シンポジウムは「FOLENS のネットワーキング：現場立脚型環境教育の戦略と実践」と題し、様々なレベルでの「ネットワーキング（関係作りと関係性の中での仕事)」こそ環境リーダーの要件であり、環境リーダー育成のための教育にも不可欠の要素であるとの考えに基づき、FOLENS プログラムを通じたネットワーキングの状況や戦略の報告と共に、シンポジウム自体をネットワーキングの場、かつ教育の場にすることを目的として開催しました。

- 第 3 回国際シンポジウムは「環境リーダーのキャリアパス」と題し、キャリアパスを自身の将来設計に役立ててほしいという思いの一方で、私たちスタッフや海外 E&R ベース教員、さらには一般の参加者にとっても、各国のキャリアパスの現状や、各分野の方の経験と期待を拝聴することが、今後の教育活動における重要な糧となるものと考え企画しました。 シンポジウムでは、開会のご挨拶に引き続き、前半は各海外拠点教員から現場立脚型環境リーダーのキャリアパスについての紹介を、後半は各界のリーダーが自身の経験と学生への期待の講演およびパネルディスカッションを行いました。 各国や各分野の環境リーダーの実情や、それぞれの環境問題に対する考え方、およびそのアプローチを伺い知ることができ、現場立脚型環境リーダーとして有すべき素養を共有できたものと思います。

- 第 4 回国際シンポジウムは、現場立脚型人材育成に焦点を当て、現場に対して貢献できるグローバル環境人材育成には何が求められるかという視点をふまえ、大学教育における「現場力」育成のあり方を検討することを目的としました。FOLENS に所属する学生及び海外教育・研究拠点教員よりプログラムの経験が報告され、外部スピーカーの方々から各「現場」においてどのようなグローバル環境人材の「現場力」が求められるかを共有して頂きました。 パネルディスカッションでは、会場からの質疑に応じる形で、大学の講義だけでなく、国内、海外を問わず現場に出て、社会性、コミュニケーション能力、行動力、柔軟な姿勢が培われることが期待されること、そしてそうした「現場力」が真の現場立脚型環境リーダーの資質として重要であることが確認されました。また、学生へのメッセージとしては、失敗を恐れずにあらゆるチャンスをつかむこと、学生時代からネットワーク作りを大切にすることが強調されました。 本シンポジウムを通じて、大学教育を通じた現場体験の意義に関する議論が深まり、今後の FOLENS プログラムの更なる拡充を図っていくための大変貴重な機会となりました。

- 第 5 回シンポジウムは、2009 年度より始まった現場に対して貢献できるグローバル環境人材育成プログラムが、今年度は最終年度となることから、今までの 5 年間を振り返り、どのような成果が出てきたか、また今後その成果を本学に根付かせるために、なにができるかを議論することを目的としました。シンポジウム第一部では、FOLENS の成果と今後の展望をセンター長より報告し、引き続き FOLENS 卒業生、農工大教員より成果を発表しました。第二部では、他の「戦略的環境リーダー育成拠点形成」事業実施の東京大学、横浜国立大学教員より各大学での取り組みと展望を話して頂きました。引き続きパネルディスカッションでは、農工大教員、海外拠点大学教員と上記２大学教員で、今後の FOLENS の展望について討議し、進行役より纏めで「輪」の大切さが強調されました。閉会の辞では農工大教員より、「既に 41 人の現場立脚型環境リーダーを輩出でき、海外拠点校教員との共同研究が進み、国際協力活動が始まっているが、今後の継続的な協力が必要である」とのコメントがありました。本シンポジウムを通じて、”Link will not die”の精神で、海外拠点校と本学教員、更に FOLENS 卒業生を加えた Network を強め、また本学に英語での講義、フィールド実習（インターンシップ）、ポストフィールド報告会、農工融合セミナー等を残すことが大切であることを確認しました。

The International Symposium held each year was originally planned as a multi-functional occasion. It was not just an opportunity to publicize the results from the program but also to educate students, to create a base, and moreover to form the principles for the program management. The symposiums were conducted for five years as follows:

- The first International Symposium was entitled “The launch of the Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa (FOLENS) with International Partners” and was held as an opportunity for the FOLEN members, the faculty members of the overseas Education and Research (E&R) Bases, the faculty members of this university who cooperated in the program, as well as the administrative staff, to meet together in one place to share information about the program. Guests from JICA and NGOs were also invited to join the discussion on “The Quality and Ability Required for Leaders in Environmental Sectors” and the basic systems and principles of the program management were set up at this meeting.

- The second International Symposium was entitled “Networking in FOLENS: Strategy and Practice of Field-Orientated Education for Leaders in Environmental Sectors”. Based on the notion that “networking (relationship building and the work within the relationship)” at various levels is a requirement of a leader in environmental sectors and is also an essential component of the education to nurture those leaders, the objective was to make the symposium itself a place for networking and also a place of education, along with activities, such as reporting the current situation and the strategies for networking through the FOLENS program.

- The third International Symposium was entitled “Career Path of Field-Oriented Leaders in Environmental Sectors”. The aim was to provide an opportunity not only for the students to create a better picture of their future plans, but also for us, the staff, the faculty members of the overseas E&R Bases, as well as for the general participants to gain important experiences which would benefit future educational activities though understanding the current status of

career paths in various countries and learning from the experience of experts from different fields of specialty. Following the opening remarks, the careers of field-orientated leaders in the environmental sectors were introduced by each faculty member of E&R Base in the first half of the symposium, and in the latter half, lectures and panel discussion were given by the leaders from various fields on their experience and expectations. The symposium participants were able to learn about the current status of leaders in the environmental sectors from various countries and fields of specialty, the different perspectives of those leaders towards environmental issues as well as their approaches. In addition, the essential requirements necessary to be a field-oriented leader were shared among the participants.

- The forth International Symposium aimed to examine the way to train "field-orientated mind and skill sets" at university level, focusing on the field-orientated human resource development from the perspective of what is required for the development of global environmental human resource to be able to contribute in the actual field. The experience acquired in the program was reported by the FOLENS students and the faculties of the overseas E&R Bases, and information was shared on what kind of "field-orientated mind and skill sets" of the global environmental human resource were required in each "field" by the guest speakers. In the panel discussions, through answers to the questions from the symposium participants, it was confirmed that leaders are expected to nurture their social and communication skills, their abilities to take action and have flexible minds and attitudes by going out in the field beyond university lectures, whether it is in their own country or in different countries. It was felt that such "field-oriented mind and skill sets" are an essential quality to being a real field-orientated environmental leader. In addition, it was emphasized, as a message to the students, that they should take every opportunity without being afraid of failure and place an importance on networking right from their school years. Through this symposium, we were able to deepen the discussion on the importance of 'in the field' experience through university education, and it was a valuable opportunity to plan the further expansion of the FOLENS program.

- Being the last year of the global environmental human resource training program, which started in 2009 to contribute to the actual field, the fifth International Symposium was aimed at reflecting on the five-year program as a whole, to consider the outcomes and to discuss what could be done in order for those outcomes to take root in this university. In the first part of the symposium, the outcomes and future prospects of FOLENS were reported on by the program director. This was followed by presentations on the outcomes by FOLENS graduates and faculty members of the Tokyo University of Agriculture and Technology (TUAT). In the second part, faculty members of The University of Tokyo and Yokohama National University, who also conducted "International Environment Leaders Training Program," shared their program activities and future prospects. In the subsequent panel discussion, the faculty members of TUAT and overseas E&R Bases, along with the faculty members of the above-mentioned universities, discussed the prospects for the future of FOLENS, and the importance of "links" was emphasized by the facilitator in the conclusion. In the closing remarks, a faculty member of TUAT announced that 41 Field-Orientated Leaders in the environmental sectors had graduated from the program, and asked for continued support of the program, as collaborative research with faculty members of overseas E&R Bases would be developed

and international cooperation activities would begin in the future. Through this symposium, it was confirmed that it is important to strengthen the network of faculty members in overseas E&R Bases and this university along with FOLENS graduates, with the spirit of “The links will not die”, and to continue lectures in English, field practices (internship), post-field reporting seminars, and seminars integrating agriculture and technology.

（米田健一／ Kenichi YONEDA）

6-9-2. 第 5 回国際シンポジウム「現場立脚型環境リーダー育成プログラムの成果と展望」パネルディスカッションより/ The Record of Panel Discussion: the 5th FOLENS international symposium – The Outcome and Future Prospects of FOLENS Program

文部科学省事業最終年度となった 2013 年 11 月、FOLENS プログラムの 5 年間の成果と展望をふりかえるシンポジウムを下記の通り開催した。第一部で FOLENS プログラムに関わった学生や教員の声を紹介した後、第二部では本学同様に環境リーダー育成事業を実施した横浜国立大学、東京大学よりゲストを招き、さらに FOLENS 海外研究教育拠点大学の教員と本学教員が加わって、今後へ向けた討論を行った。以下にこの記録を掲載する。

In November 2013, approaching the end of the project financed by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), FOLENS organized the international symposium to reflect on achievements and prospects as below. After the introduction of the thoughts and opinions of FOLENS students and faculty in Part I, the panel discussion was held in Part II. Guest speakers were invited from two universities that have also implemented the environmental leadership development programs with the MEXT fund, Yokohama National University and University of Tokyo. In addition, guests from FOLENS Education and Research Base universities and TUAT faculty joined the discussion for the future. A record of this panel discussion follows the symposium overview below.

第 5 回国際シンポジウム「現場立脚型環境リーダー育成プログラムの成果と展望」
開催日： 2013 年 11 月 16 日（土）
会場： 府中キャンパス第一講義棟 25 教室

プログラム：
司会：二ノ宮リムさち（環境リーダー育成センター特任准教授・チーフコーディネーター）

開会・来賓挨拶(13:30-14:10)
13:30 開会の辞: 國見裕久 (東京農工大学 理事・教育担当副学長)
13:40 来賓挨拶: 木下圭晃 (文部科学省研究開発局環境エネルギー課 推進官)
13:50 環境リーダー育成センター プログラムの活動報告: 高田秀重 (東京農工大学教授・環境リーダー育成センターセンター長)

第一部: FOLENS 学生、終了生と東京農工大教員の声 (14:10-15:10)
14:10-14:55 学生、修了生の声：
Harakhun Tanatavikorn(東京農工大学大学院 工学府 博士課程)
牧田朋子(修了生・農林水産省)
ビデオメッセージ：Roeurn Siranet(香川大学大学院 博士課程)、Pheng Sokline(Lecturer, Royal University of Phnom Penh)、Na-Ngern Prathomrak(Tanavasri Ferm's Biological and Ecological Learning Center)
二ノ宮リムさち（環境リーダー育成センター特任准教授・チーフコーディネーター）

14:55-15:10 教員の声: 尾崎宏和 （環境リーダー育成センター特任助教・ラボコーディネーター）
15:10-15:30 休憩

第二部 将来に向けての討論 (15:30-17:30)
司会: 五味高志 (東京農工大学　准教授・環境リーダー育成センター副センター長)

15:30-15:50　小林正典（横浜国立大学大学院・環境情報研究院・自然環境と情報部門　特任教員（准教授）
15:50-16:10　片山浩之 （東京大学大学院　工学系研究科　都市工学専攻　都市環境工学大講座　准教授）
16:10-17:30 パネルデスカッション（16:10-17:30）
ファシリテーター: 五味高志 （東京農工大学　准教授・環境リーダー育成センター副センター長）
パネリスト: 片山浩之、小林正典、Mohamad Pauzi Zakaria （マレーシア・プトラ大学 教授）、多羅尾光徳（東京農工大学　准教授）

会場（海外教育研究拠点大学）: John Ofosu-Anim (ガーナ大学（ガーナ）准教授）、Le Viet Dung (カントー大学（ベトナム）准教授）Tiwa Pakoktom (カセサート大学（タイ）助教)

閉会挨拶 (17:30-17:40)
17:30-17:40 寺田昭彦（東京農工大学　准教授）

The 5th FOLENS international symposium – The Outcome and Future Prospects of FOLENS Program
Date: November 16, 2013
Venue: Room 25 Lecture Hall 1 for Faculty of Agriculture, Fuchu Campus,

Program
MC Sachi Ninomiya-Lim (Chief Coordinator, FOLENS, TUAT)

Opening Remarks / Introduction (13:30-14:10)
13:30 Opening Remarks: Yasuhisa Kunimi (Vice President for Education, TUAT)
13:40 Yoshiaki Kinoshita (Director for Environmental Science and Technology, Ministry of Education, Culture, Sports, Science and Technology, Japan)
13:50 Progress of FOLENS Program: Hideshige Takada (Director, FOLENS, TUAT)

Part1: Voice of FOLENS Students, Graduates, and TUAT Faculty (14:10-15:10)

14:10-14:55 Voice of FOLENS Students & Graduates
Harakhun Tanatavikorn(Graduate School of Engineering, Department of Applied Chemistry, TUAT)
Tomoko Makita (Ministry of Agriculture, Forestry and Fisheries staff, Japan/alumni of TUAT)
Video Message from Roeurn Siranet (Kagawa Univ., Doctoral Course Student), Pheng Sokline (Lecturer, Royal University of Phnom Penh), and Na-Ngern Prathomrak (Tanavasri Fern's Biological and Ecological Learning Center)
Sachi Ninomiya-Lim (Chief Coordinator, FOLENS,TUAT)
14:55-15:10 Voice of Faculty: Hirokazu Ozaki (Laboratory Coordinator, FOLENS, TUAT)

15:10-15:30 Coffee Break

Part2: Discussion for the Future (15:30-17:30)

MC Takashi Gomi (Deputy Director, FOLENS, TUAT)
15:30-15:50　Masanori Kobayashi (Associate Professor, Graduate School of Environment and Information Sciences, Yokohama National University)
15:50-16:10　Hiroyuki Katayama (Associate Professor, Dept. of Urban Engineering, School of Engineering, the University of Tokyo)
16:10-17:30
Panel Discussion(16:10-17:30)
Facilitator: Takashi Gomi
Panelists:
Hiroyuki Katayama, Masanori Kobayashi
Mohamad Pauzi Zakaria (Professor, University Putra, Malaysia)
Mitsunori Tarao(Associate Professor, TUAT)

Floor:
John Ofosu-Anim (Associate Professor, University of Ghana, Ghana)
Le Viet Dung (Associate Professor, Can Tho University, Vietnam)
Tiwa Pakoktom (Assistant Professor, Kasetsart University, Thailand)

Closing Remark
17:30-17:40 Akihiko Terada (Acting Deputy Director of FOLENS, TUAT)

五味高志（環境リーダー育成センター　副センター長・東京農工大学）：

では今から、環境リーダーの今後と見通しについてパネルディスカッションを行いたいと思います。正面に 4 名のパネリストの方々がおられます。また、フロアにも 3 つの海外拠点大学の皆さんがおられます。パネルディスカッションを始める前に、東京大学と横浜大学、そしてマレーシアの大学における活動についてのお話も伺います。まずパネリストの一人である本学の多羅尾先生をご紹介したいと思います。先生には、FOLENS プログラムと、私たちが過去 5 年間に実施してきたプログラムについて、手短にコメントしていただきましょう。

多羅尾光徳（東京農工大学）：

ご紹介、ありがとうございます。多羅尾光徳と申します。私は東京農工大学の准教授です。こういった複雑な問題や新しい問題について英語でお話しするのはちょっと難しいので、日本語でお話ししたいと思います。

FOLENS プログラムに 5 年間関わらせていただきまして、いろいろ成果をあげたことは、これまでの先生方のご報告にもありますので、そこでは繰り返しませんので、今後どうするかということについて、またちょっと違った視点からお話をしようと思います。FOLENS プログラムで蓄積した経験をどうやって継承していくかということが必要になると思います。そのためには、大学として FOLENS プログラムを今後続けてい

くにあたって、大学としてどういう位置付けで臨むのかということの議論も、ここですることじゃないかとは思いますけれども、やはり大学執行部の方がこういうところに参加していただいて、それでこの成果を共有していく。そしてどうするかっていうことを一緒に考えていただきたいと思うんですけれども。先ほど副学長がおられたところで、そういうこと、話をしたかったなというふうに思います。

これは教育プログラムですけれども、今、日本の文部科学省などが日本の大学のグローバル化ということを言っておりまして、今度の国会で研究開発力強化法という法律の改正案が出ていて、そこでも国際化を進めるということが一つポイントとなっています。この法案に対する評価はいろいろあると思いますけれど、そういうグローバル化ということが一つのキーワードとなっている訳です。そうすると、教育プログラムであると同時に大学の国際化を進めるということの位置付けも必要であろうというふうに思います。そういった視点が果たしてあるのだろうかということを常々考えておりまして、そういうところは、こういう場にそういった大学の意思決定を担う人たちが来ないということは、少々残念であると思います。また文部科学省に対しても、こういった 5 年間の財政支援というのは非常にありがたいんですけれども、その後どうするかというのは、あとは自前でやりなさいっていうのは、やはりちょっと残念である。ここで言うことなのかどうかは分かりませんけれど。だらだらと続けていくのはよくないですけども、何年かごとの区切りっていうのは必要とは思いますが、きちんと成果をあげているものに対しては、やはり継続できるような、そういったいろいろな支援が必要なのではなかろうか、というふうに思います。

農工大における FOLENS のこの成果をどうやって継承していくかということについては、いろいろなところで話されていますし、先ほどセンター長のほうから、今後どうするかというようなことのお話がありましたけれども、ああいった形での継続をしていくっていうことは、ぜひやっていただきたいと。それについては、私も今後も協力をしていくつもりですので、これをもっと多くの農工大の先生たちの共通認識としていけるような努力も必要であろうと思います。ちょっとこれまでの話の流れとは全然違う視点からの話でしたけど、すみません、以上、私の意見です。

五味：

多羅尾先生、大変貴重な意見ありがとうございました。これは、引き続き話し合うべき非常に重要な側面です。

本日のシンポジウムからのメッセージとして、現在私たちが抱えている課題を要約したいと思います。もちろん、これは学生諸君にとっても非常に重要なことです。先ほど学生からのメッセージを二ノ宮先生がまとめてくださいましたし、実際この会場にも FOLENS プログラムに参加している学生もいます。

第一に現場経験とスキルについてです。これは非常に重要で、このプログラムを通じても、学生は自分の知識や意見について自信を得ます。この自信は実は文化と人々、コミュニケーションについての学問としての理解に結びついています。また、農工大の先生たちによる大学へのアプローチに関する提案もありました。これは研究の中核にたどり着くために大切なことですし、また、現場力やコミュニケーション、このプログラム発展などに関する基本的な情報を知ることも大事です。先の小林先生のこの講演には、専門知識やリーダーシップに対する責任や情熱といった重要な側面について指摘がありました。どうすればこういった情熱

を得ることができるでしょうか。動機付けをもって始めることは極めて重要なことです。片山先生がリーダーシップの概念について話されましたが、リーダーシップの概念および育成を私たちはどのようにみているか、片山先生はこれについて説明されませんでしたが、在籍する学生をリーダーとして育成することについての今回のプレゼンで、私はこれを理解しました。そして最後に、多羅尾先生からご指摘がありましたのは、継続性のレベル、つまり、どのようにして継続性のレベルを獲得するかということでした。継続するためには、プログラムや職員、施設、大学、あるいはもっともっとグローバルな側面が必要です。

このメッセージに基づけば、もちろん、これは重要なことなのかも知れませんが、国際的なものと地域的なものとの間にはバランスがあると言えば非常に簡単ですが、しかし、これは実際、すべてのプログラムを提供しましたが、他のプログラムの展望について考える機会もあります。私たちが行っている研究だけでなく、こういった他の学問、地域の人々や文化も大切です。また、これらのプログラムを通じて重要なのは、プログラムの継続だけでなく、学生のさまざまな側面や、教員と学生が環境問題や環境技術について理解するにあたって野外観察志向や学際的な精神を持つことが重要だと感じていることです。また、時間的拘束やプログラムの継続の難しさ、このプログラムへの参加にモチベーションを持ち続けることの難しさなど、いくつか否定的な側面もあります。

この大学プログラムには、もちろん、先生方も関与しています。先生方は指導について新しい見識を持っておられ、そして、学生は本当に高いモチベーションを持っています。これは私たちのプログラムにとって非常に重要なことです。大学には講義の内容を重視するという難しい側面があります。そして、これは更に大きな側面で原因ですが、学生たちには 2 年間の修士課程における大学が求めることと時間的制約があります。このことが常に限界となっています。本日のこのメッセージに基づけば、私たちが直面している問題は今後どうやってプログラムを継続できるかということです。前におられるパネリストとフロアのパネリストの方々から、どうすればこれらのプログラムを継続できるか、または、将来にわたって充実した形でプログラムを継続する上で重要な側面は何かについてご意見を伺いたいと思います。

Le Viet Dung（カント―大学）：

ありがとうございます。つい昨日、私たちは FOLENS の成果について会議を持ちました。そして、私たちはみな今、FOLENS が、皆さんが今ご存知のように、五味先生が要約されましたが、私たちはみな、将来のネットワークのことを考えています。そして私は今日、日本では 17 大学が環境教育に対して文科省のサポートを受けてきたことを知りました。たとえば、農工大の FOLENS や東京大学の APIEL、横浜大学の SLER です。すでに 17 のプロジェクトが実施されていると思いますが、それはまだ基礎の段階であり、この 3 つの大学で行われているプロジェクトのように、非常によい成果を挙げておられますが、さらに向上していく必要があります。私はですから、初めにこの 3 つの大学を、次に 17 の大学すべてをどのようにリンクするかを学びたい。これは文科省に聞くべきことかもしれませんが、私は明日帰国してしまいますので、時間がありません。ですから、私の最後の提案は、農工大がそれについてさらに議論することです。私たちが FOLENS で行ったことを共有します。高田教授がおっしゃったようにリンクは無くならない、繰り返しになりますが、農工大が 3 つの大学、そして 17 校すべての大学をリンクすることについて考えていただければと思います。

Tiwa Pakoktom（カセサート大学）：

みなさん、こんばんは。私はタイのカセサート大学から来ましたティワと申します。将来の展望について、タイに関しては（FOLENS の）教育・研究拠点としての実績をもとに、研究を続けられるとここで申し上げたいと思います。現在、私たちは TRF(タイ研究基金)のプロジェクトを抱えており、環境関連の研究の資金を得ています。特に私の場合は経済的な作物に関するもので、これはタイ政府とタイ国民にとって重要なテーマです。昨日、会議で申し上げたように、タイでの FOLENS プログラム修了生のつながりを保ちたいと考えていて、私たちが 3～4 年前から続けてきたプロジェクトにもタイの農工大同窓生に加わってほしいと考えています。将来、もし農工大が別のプロジェクトを行うのでしたら、環境は単に我々の間の問題だけでなく、特に地球温暖化といった大きな問題に対する大規模なプロジェクトに拡大するという可能性も重要だと思います。FOLENS の最終年に、農工大と高田先生とスタッフの皆様に対し、カセサート大学をお招きいただいたことを重ねて御礼申し上げます。カセサート大学にご協力いただいた他の大学や、これまで米田先生、寺田先生、その他の大学、たくさんの方々と協力してきましたが、今後も他の FOLENS メンバーの方々、多くの先生方ともっと協力してゆきたいと考えております。ありがとうございました。

五味：

ありがとうございました。では、続けましょう。

John Ofosu-Anim（ガーナ大学）：

ありがとうございます。昨日、FOLENS の担当者の方々と行った討論会で、私たちは FOLENS を越えて先に進むにはどうすればよいかについて見解の共有を行ったと思います。私は、現在のところ農工大のスタッフとある程度つながりを確立できていると申し上げました。この連携を強化することにより、先に進むことができると思います。私たちは現在、自分たちが生み出した環境問題を解決することについて検討しています。私は自分たちが前に進むなかで、少し戻ってこれらの環境問題の原因について考えたいと思っています。横浜国立大学の先生はご発表のなかでコミットメントについて述べられ、また私たちは専門知識・技術に加えてリーダーシップも持たなくてはならないとおっしゃいました。しかし、これらすべてを備えていても、私たちは環境問題を作り出します。前進することに加えて、私たちは科学者として、問題の原因を特定し、問題が起こる前にそれを防止したり管理したりせねばなりません。

私たちはまた、発展途上国にいる自分たちが特有の問題を持っていることを認識しています。先ほど FOLENS での経験を発表した学生さんの一人が、日本とタイのごみ処分場を見せてくださいましたが、私の国ガーナでも同じことが起きていると思いました。発展した国と発展途上国のごみ処理の違いは、その国における経済状態と教育レベルの違いによると思います。我々の政府にも、環境保護について市民を教育する役割があります。FOLENS に、ここに参加する機会を与えてくださったことに今一度お礼申し上げます。昨日も申し上げましたが、FOLENS は「will not die」、続いていくでしょう。

五味：

先生方、ありがとうございました。先生方からコメントをいただきました。これらのコメントは実は、検討してみますと、プログラムの継続性に関して 3 つのレベルに分けることができます。ジョン先生がおっし

やったように、世界中で環境問題が起きています。これは国内プログラムや地域プログラムに見られますが、環境リーダーとしてプログラムの継続に対する情熱を持つモチベーションとなります。

Dung 先生がおっしゃった第二の論点は、7 校の大学が一つになってこれらのプログラムを日本で継続しうるという点です。そしてその継続のために、私たちは 17 大学の合同ミーティングを 9 月に行いましたが、これがこれらのプログラムを継続するモチベーションの一つになることでしょう。また、ティワ先生がこれはもう一つのレベルであると示唆されましたように、これは学生レベルかもしれませんが、そうでないかもしれません。もし、卒業生レベルならば、タイ国内、またはこういった様々な国々、または日本と他の諸国との間のリーダーのネットワークです。こうして、これらのプログラムを将来継続していくことができます。プログラムの継続について少しコメントをいただきたいと思います。小林先生はプログラムの継続のための情熱や専門知識・技術、リーダーシップについてお話されました。そこで、私はこれらのプログラムのスキームと継続的なプログラム、そして FOLENS プログラム終了後についてなど、どのようにしてこれを発展させることができるかについてコメントをいただきたいと思います。

小林正典（横浜国立大学）：

わかりました。有難うございます。私も多くの仲間の皆様のご意見にまったく同感です。そこで、多羅尾先生の 5 年間という期間についてのコメントをフォローしますと、他の国々は 10 年、20 年という長期的視点で人材に投資しているのに、どうして日本は 5 年ごとに変え続けるのでしょうか。どうして、私たちはプロジェクトをストップしなくてはならないのでしょう。私たちがしたことの一つは、利害関係者の対話の促進に尽力することでした。昨年の 9 月 23 日、私たちは国連大学で国際シンポジウムを開催し、ビジネスリーダーと政治リーダー、および福島県出身の衆議院環境委員会委員長、吉岡氏を招待しました。ただし、吉岡氏は現在、島根県か西日本のどこかから選出されているのだと思いますが。これまで私たちがもっとうまく取り組むべきだったのは、こうした大学の環境持続可能性のためのリーダーシップ育成プログラムの成果とポテンシャルを、実業家や政治に関わる人々、政治家、意思決定者に示すことだったと思います。建築業界にいる他の多くの人々はそうしているのに、環境活動家はなぜか非常におとなしくて、仕事にだけ没頭して、考えない―どうせお金はくると。他の人々はたくさん資金集めのためのロビーイングをしたうえで資金を確保しているのです。私たちにはそれが欠けています。ですから、私は一つ、環境リーダーシップ開発プログラムについての利害関係者の話し合いを促進することを提案したいと思います。これは非常に重要なことであると考えます。

第二に、東京農工大学はこの分野に非常に重点を置いておられると思います。この姿勢を失ってはいけないと思いますし、政治や科学、この分野の利害関係者とのつながりを重視しなくてはいけないと、私はよく話しています。ですから、この分野と科学、政策とのつながりにおいて教育と研究プログラムを強化することができれば、私たちのプログラムがもっと大きな可能性を持っているということを大衆に対してもっとよくアピールできると思います。

三つ目はうちの大学にも同じことが言えるのですが、ここの大学にあるかどうかは知りませんが、私たちはセンターが必要です。アメリカのバージニア工科大学には「グローバルサステナビリティにおけるリーダーシップのためのセンター」（The Center for Leadership in Global Sustainability）というセンターがあります。彼らはこういったセンターを作ったのですが、私は何名の教員とスタッフが働いているか知りませんが、そ

んなことはかまいません。まずは作ることです。まずコンセプトを売り込まなくてはなりません。こういったアイデアを人々に売り込むのです。うちの学長が言いました。「小林先生、もし特別予算が獲得できればセンターは作れますよ。」と。しかし、文部科学省にいけば、「まず自前の資金で予算配分をしなさい。そうすれば、特別予算の配分について考慮しましょう」と言います。ですから、これはニワトリが先かタマゴが先かという問題です。ニワトリが先かタマゴが先かという問題なら、特別予算を獲得するために、まず小さな一歩を踏み出してはどうでしょうか。私は必ずしも大学の意思決定に影響を及ぼす地位にいません。しかし、私は常に、環境について学びたいと考えている誰かが、「日本に行って環境について学ぼう」と言ってくれるのを望んでいます。私は日本のようなテクノロジー国家、金融国家に、そのようなときが来るのを望んでいますが、環境科学について学びたいと考えている人はきっと「スウェーデンに行こうか、ドイツに行こうか」というふうに考えるのでしょう。私は日本が、環境の持続可能性について学び研究できる設備が一番整っている国だと名指しされるようであってほしいと思っています。そして周りを見渡せば、私はつい先ごろ、国立公園に関するアジア会議を終えて仙台から帰ってきたのですが、地元の環境保護活動家は、沿岸部の生態系を完全に破壊してしまう防潮堤の建設を止めさせるのに奮闘していると言っています。その防潮堤は100年に1度起きるかどうかという津波から町を守るためのものです。高さ14メートルの防潮堤を建てようとしているのです。それはまるで野球のバックスクリーンのようです。それに面して立つと海が見えません。それに、家はすべて高台のほうに移動していますから、そのあたりには誰も住むことはないのです。じゃあ、どうしてそんな防潮堤を築いているのでしょう。すべての海洋生態系が数年で失われてしまう可能性があると警告されているのに。私たちは海の自然を守りたい、いや、言葉が違います、私たちは守らなくてはなりません。私たちは将来世代のためにそれを守らなくてはなりません。あそこの人々はとても優しく穏やかなので、防波堤を建設している人々と対立したくないのだと思いました。彼らは自由に見解を表すことができない社会的、政治的状況にあるのかもしれません。しかし、同時に、ちゃんと立ち上がって声を上げないことには、海の自然を失ってしまうかもしれません。

放射性廃棄物による汚染について考えますと、オリンピックが日本で2020年に開催されますが、あのとき、多くの人々が、この国の放射能汚染の状況に関してメッセージが適切に伝えられていないと言っていました。ですから、日本は環境保護と持続可能性の促進を他国に先駆けて行うためにもっと努力しなくてはなりません。そうしないのなら、私たちは職と給料を維持するためだけに、環境リーダーの開発について話し続けることになります。そういうわけにはいきません。John先生がおっしゃったように、そうであってはならないのです。より大きな持続可能性のための変化を生み出す媒介を創造しなくてはなりません。そうでなければ、自然環境を持続できません。教育・研究プログラムをサポートするより大きなパートナーシップを生み出す、さらなる概念の転換がまだできることを望みます。ありがとうございました。

五味：

ありがとうございました。聴衆の皆様からご質問はありませんか。

小林先生は戦略の重要性と本研究のコンセプトおよび概念化についてまとめてくださいました。片山先生からも、東京大学の場合の開発の戦略またはコンセプトについて、ご意見をお伺いしたいと思います。

片山浩之（東京大学）：

はじめに、これは私の意見であることを申し上げておきたいと思います。私は東京大学を代表してここに来ておりますが、大学としてではなく、自分としての意見を述べさせていただきます。

環境リーダーシップ教育は、私が思いますに、このチャンスを利用して、学生に環境問題の全景をある程度見せて、問題全体をとらえさせれば、個々の学生は自分の研究題目を決めてその細部に取り組むことができます。私は物事の大要も細部も見ることが大事だと思います。このプログラムと環境リーダーシッププログラムは大要を捉えるのに非常に助けとなるツールであったと思います。プログラムがいずれの研究に関連していても、そのような教育研修は学生が自分の研究に対してモチベーションを抱けるようにするのに必要ですから、これは非常によいことでした。学生はやる気になり、自動的によりよい研究結果を生み出しますから、これは学生にとっても教員にとっても非常に喜ばしいことです。

この種のプロジェクトを継続するには、5 年では短すぎます。私たちは常に同じような問題を抱え、省庁に訴えなくてはいけないことがたくさんあります。非常にあからさまに言うと、たった 5 年間しかなければ、どうすればよいのでしょうか。一つは、研究プロジェクトをまったく犠牲にすることなく、恩恵を受けなくてはならないということです。学生は恩恵を受けるでしょう。それはいいと思いますし、ある教員が彼らの時間を使って、学生が十分な恩恵を受けるのであれば、それはかまいません。問題はおそらくプロジェクトや研究プロジェクト、准教授またはその類の人々です。何か他の研究に対してもっとエフォートが割ければ、もっと自由なエフォート管理ができるならば、テニュアへの道やキャリアをなんとかできるしょう。しかし、文部科学省がいつもプロジェクト研究者の労力と時間を管理しようとするならば、私たちはそのような若くて非常に有望な研究者を犠牲にしなくてはなりません。ですから、これが最大の欠点であると私は思います。ですから、私たちはそのためにもっとよい制度を持たなくてはなりません。もし、その部分を解決できるのであれば、もちろん、5 年というのは十分ではありませんが、しかし、誰も犠牲になっておらず、みんながその状況を受け入れているというのであれば、このプロジェクトはより良いものだったでしょう。私はそのように自分を納得させています。

ビジネス関係者について一言加えたいと思います。私たちはたぶん上手に交渉できていないのでしょうが、ようやく 3 つの会社から助成を得ることができました。その一つはニッサン、もう一つはコカコーラ、三つ目は大和証券です。これらの会社はたくさんのお金をくださいましたが、それでもプロジェクトを継続するには十分ではなく、学生がちょっと研究を続けられる程度です。そこで、私たちはこれらの会社から若い社員の皆さんをご招待して、我々のユニットなどに参加していただきました。私たちは協力体制を持っていますが、それは十分ではなく、プログラムの継続は簡単には受け入れられず、ビジネスセクターとの協同は、日本の現在の経済状況では、そんなに簡単にはできません。

五味：

ありがとうございました。

じゃあ、酒井先生、よろしいでしょうか。

酒井憲司（東京農工大学）：

私は酒井憲司と申します。私はこのプログラムに参加している教職員です。過去 4 つのシンポジウムがありましたが、これが私にとって初めて参加するシンポジウムで、非常に感銘を受けました。また、私は FOLENS の将来の展望については非常に楽観的です。というのも、このシンポジウムを通じて次のことを学んだからです。私は農業技術者であり、環境科学の専門家ではありません。環境科学を扱う環境問題専門家としては、非常に専門的なイベントであり、この場合、問題解決のためにはリーダーシップが必要です。それは指揮官タイプのリーダーシップではありません。誰もが、すべての利害関係者が、リーダーシップを発揮しなくてはなりません。その部分が非常に大切です。それが、私がこのシンポジウムで皆さんから学んだことです。

学習に基づいた統合を促すには、リーダーシップと同じ戦略が有用でしょう。多羅尾先生がお話になりましたように、ここに学長はおられませんでしたが、おそらく、将来の可能性に向けて私たちがこの問題を解決できると思っておられるのでしょう。私たちはすでにどのようにすればよいかわかっています。他の教職員が私たちのリーダーシップを示しており、各人またはそのような学生がリーダーシップを見せるかもしれず、それにより私たちは問題を解決できます。お金は重要かもしれませんが必須条件ではありません。大切なのはお金そのものではなく、自分たちのお金をどう使うべきか私たちがわかっているということなのです。お金をどのように適切に使用するかを知るためには、インフラが必要です。インフラを開発するには･･･重要なインフラの一つはネットワークと友情とお互いを知ることです。私たちにはすでにそれがあります。それは 17 校の大学であり、そのすべてが世界でもよく知られた施設や大学です。ですから、5 年間は短かったですが、そういったインフラを得ることができたことは非常に喜ばしいです。ありがとうございました。だから、私は非常に楽観的なのです。

五味：

酒井先生、ありがとうございました。こういった観点から、片山先生は教育プログラムには大局的な把握が必要であるとお考えになっており、酒井先生の見解は資金の問題に関連しているといえるでしょう。私たちにそんなに大金はいらないでしょうが、おそらく、小林先生が提案されたように、センターのようなものを作るのもよいでしょう。このプログラムが環境リーダープログラムとして社会や他の国々に対する戦略に使えるとアピールできるかもしれません。実は残念ながら同時通訳はもうすぐ終わります。しかし、ここで何かおっしゃりたいことがあるようでしたら、コメントでも質問でもお聞かせください。学生の方々にもお話しいただきたいですし、おそらくパネリストの方々も、もう少しお話になりたいのではないでしょうか。

Mohamad Pauzi Zakaria （マレーシアプトラ大学）：

お時間をいただいてすみません。私はいつも、FOLENS の後のトンネルの終わりにはいつも光があると常に信じています。私も自分の意見を述べますので、大学の意見を代表しているわけではないかもしれません。私の大学で起きていることについて、私は大学の職員ですから、いくつか言いたいことがあります。うちの大学には新しい資金調達の戦略があります。お金に関しては、誰かがお金が大事だと言っていましたが、私は、資金調達は重要ではなく、お金は私たちにとって前進するための乗り物だと思っています。UPM は期限付きの資金提供をします。あなたはテーブルの上にお金を置き、私にあなたのお金を見せる。私たちは私たちのお金をあなたのお金と 1:1 の割合で見せる。たとえば、あなたが私たちにプロジェクトを 200 万円でくれたら、私たちも 200 万円を提供する。それで、私たちは合計 400 万円持っていることになるのです。

過去においては、私たちは一方通行、つまりたくさんのお金が通常日本からやってきました。私たちはプログラムを運営するために、最小限の物理的なインフラを提供しただけでした。今回は、環境に対する認識がわが国内で高まりつつあるため、私たちは新しい戦略を持っています。私たちにはたくさんの協力者、特に若者たちがいます。彼らは環境教育や環境のフィールド調査に関わりたいと考えています。環境科学は日常とかけはなれた難解なものではありません。これは基礎科学ですが、とっつきやすい分野です。もちろん、人々は今日の問題として、常に環境科学について話し合っています。環境問題は最優先事項ですから、政府は今では科学技術環境省に力を入れて十分な資金を提供しており、それが研究している大学にも少しずつ流れ込んでいます。この機会を生かして、これまで得ようと努力してきたものを提案しなくてはなりません。私たちはFOLENSを確立しました･･･FOLENSは職員と学生､大きくは社会にとって優れたプログラムです。FOLENSの後のプログラムを、私たちは絶対続けなくてはなりません。FOLENSは学生と教員に現場立脚型スキルについて教えてくれました。特に私と学生は過去5年間にこのプログラムから多くの恩恵を受けました。面白いことに、FOLENSに参加し、それを通じて学生が学んだことは教室での授業という状態では学べなかったことであるということに気がつきました。フィールドワークや調査旅行は生きた体験であり、FOLENSはまさにそのためのものです。FOLENSは我々の大学がこれまでに参加したなかで最高のプログラムです。完成した科学者と将来世代を育成するための素晴らしい基盤を提供してくれました。ですから、ここで終わりにするなどというのは考えられません。これは始まりに過ぎないのです。どの方向に向かうにしても、継続しなくてはなりません。先生のお一人が話されていたように利害関係者が集まってミーティングを行うなど､私たちは話し合いを持たなくてはなりません｡利害関係者の会合は非常に重要です｡なぜなら､さまざまな見解や、私たちがこれまでに見えていなかった非常に重要な側面を他の人々が示してくれることがあるからです。私たちはその道程にいかなる困難があっても乗り越えることができます。ありがとうございました。

五味：

ありがとうございました。そろそろ時間も迫ってきましたので、まとめの前にこれをお見せしたいと思います。この一部はより広い、大きな観点から見たもので、地元のものやフィールド志向のもの、一般的または特殊なもの、地域的または世界的なものなど、さまざまな種類のプログラムに私たちは多くの力を注いできました。実は、この図は昨年9月の環境リーダーシンポジウムの間に修正されました。しかし、これは特に我々の大学で修正されたもので、色が違うのは観点が違うことを示し、このフィールド志向のものについては、特に特殊なものや地域的なものに焦点を当て、しかし、これを開発するためには、これらを統合するためにより広い観点をある程度持つことが必要です。ですから、このプログラムはFOLENSプログラムが終わった後にも非常に多くの側面で継続していくことができます。

この教育研究拠点校教員の協力によって学ぶことのできるその他の重要な側面は、これは、実はこれらの大学間のつながりは、酒井先生が車座についておっしゃったように、この車座図表に付いて私たちは学際的なコースのための特別な企画を持っています。私たちにはおそらく社会的スキルが必要で、討論を通じて、私たちは比較的長い時間スケールの制度化されたプログラムを持っています。これは、この展望にとって非常に重要です。

これは主要な研究と FOLENS 志向のプログラムをつなげています。ですから、FOLENS 完了後、私たちは FOLENS 志向のプログラムを継続することができます。このネットワークを通じて、車座だけでなく、おそらく、この若い基盤のために、TUAT と 17 大学だけでなく、日本国内のその他の大学またはそれ以外の大学間の架け橋となるプログラムです。全般的に、本日のこのシンポジウムのためのこのプログラムは、もちろん、これは特別な人的資源にとって重要です。FOLENS はこの進行中の重要なプログラムのために本当に努力してきました。私たちはもちろん、FOLENS のスタッフや先生方と協力していきたいと思っていますし、これらのプログラムに対するモチベーションを持続したいとも考えています。これは教育ネットワークにとって重要なことです。パウジ先生がおっしゃったようにこれは始まりです。私たちは FOLENS プログラムを更新し続け、将来、規模を拡大し、それが環境リーダーとしての相乗効果をもたらすかもしれません。これを継続しながら、私たちは卒業生のネットワークについて討論しますし、センターもいくつか持ちたいと思っています。大学がセンターになることもできますが、私たちはこういった個々人がみな環境リーダーとしてセンターそのものとなることを希望しています。他の諸国、いや世界中において環境リーダーとなることが最も重要なのです。これで、このパネルディスカッションを終わりたいと思います。正面とフロアのパネリストの皆様、そしてこのシンポジウムにご参加くださった聴衆の皆様、どうもありがとうございました。本当にありがとうございました。これで閉会にしたいと思います。

Dr. Takashi Gomi

Okay, from now on, I would like to have panel discussions about future of the environmental leaders and perspectives. Here we have four panelists in the front and then also we have panelists at the floor from three universities, and before we start all these panel discussions, we also will hear some activities in University of Tokyo and Yokohama University and also university from Malaysia. Today, I would like to introduce also one of the panelists, Professor Tarao from TUAT and he will provide brief comment about FOLENS programs and also some education programs that we have done in last 5 years.

Dr.Mitsunori Tarao

Thank you very much. My name is Mitsunori Tarao. I am Associate Professor of Tokyo University of Agriculture and Technology. It is little bit hard for me to talk about the complicating issues and about the new ones, so I will speak in Japanese.

Dr. Mitsunori Tarao

I have been involved with the FOLENS program for 5 years. We have achieved many positive results, which have been included in the reports already mentioned by other professors, so I will not repeat them here.

I would like to discuss the future from a slightly different perspective because I think that we need to consider how we can share the experiences accumulated in the FOLENS program. To successfully achieve this, we have to discuss how we should position the FOLENS program in the university to ensure its continuation. However, I am afraid

we may not be able to discuss this here. I wish the university executives would take such opportunities to share our achievements and come together to discuss how best to move forward. I also think it would have been beneficial to discuss this when the Vice President was here earlier.

This is an educational program and Japanese government departments, such as the Ministry of Education and Science, are now talking about its globalization. A bill has been submitted to the current Diet session to revise the Research and Development Enhancement Act, and the facilitation of globalization is one of its objectives. There will be various opinions on this bill. As globalization is one of the keywords of the proposal for revision, I think it is important to position the FOLENS program as a facilitator of the globalization of the university as well as an educational program.

I always wonder if we have such an outlook. It is disappointing that we do not have anyone responsible for decision making at the university attending this event. Although we are very grateful for the 5-year financial commitment from the Ministry of Education and Science, it is a little disappointing that they are like, "that we are expected to not receive any support henceforth." I am not sure if this is the appropriate occasion to talk about this; however, I think it will not be of benefit to the program if we have no clear targets. We need to set certain goals every few years, but I believe we need support for the continuation of the education program that has been producing good results.

There has been much discussion on how best to pass on the accomplishments of the research conducted in the FOLENS program at the TUAT on various occasions. I strongly agree with the Head of the Center, said earlier about the future and really want him to pursue what he suggested to continue the program. I intend to continue working to help him achieve it. I believe we need to make an effort to share this awareness with more faculty members in TUAT.

I apologize for having changed the stream of the discussion with my different point of view. Thank you very much for listening to my opinion.

Dr. Takashi Gomi

Thank you very much, Tarao-sensei. This is very important aspect which we need to continue to discuss.

I summarize some of the issues which we have today for the message from today's symposium. Of course, for the students, this is very, very important. We have a message from the students summarized by Ninomiya-sensei and also there are students actually involved in these FOLENS programs.

First point is about the field experience and skill. This is very important and also through this program, students have the confidence for their own knowledge or own opinions, which this confidence actually connect to this understanding as disciplinary for cultures and people and communications. Also, there was a suggestion by the faculty members' university approach which is important to get to this core of the research and also knowing the fundamental information of the mind and skill sets or also the communications and also this program development. From this talk from Professor Kobayashi, there is an important aspect to the commitment or the compassions for expertise and

leaderships. This is connecting to this – how we can get these compassions? This is a very, very important starting with motivations and also from Professor Katayama and concept of the leaders, how we see as the concept leaders and fostering and - this is actually from this – he didn't explain this but I found this from the presentation on fostering enrolled students for this as leaders, and the last point from Professor Tarao is the level of the continuities, how are we going to get the level of continuities. Programs, staffs, or institutions or universities or maybe much, much global aspect for the continuities is necessary.

Based on this message and of course this might be something – it is very simple to say there is balance between the global and the regionals, but this is actually - all these programs provided and also there is chance looking at other perspectives. That is important, not only this research what we are doing but also these other disciplinary and other communities or cultures. Also, throughout these programs, it is not only the continuity of the programs but it's the various aspects of the students and also faculty staffs and students having the positive feelings for the importance of field observation mind or interdisciplinary mind for understanding the environmental issues or skills. Also, there are some negative aspects which are time constraints, continuity of programs, or keeping in motivation for joining this program.

For this university's programs, of course it is involving the faculty staffs. Faculty staff has a new insight for the teaching and high motivation of the students and the students have really high motivations. This is very important to our programs. There is some difficult aspect that focuses on content of the lectures, and because this is a broader aspect, students have the request or time constraint for 2 years master's program. This is always the limitation. Based on this today's message, the problem we are facing is how we can continue the programs in the future. We would like to have from the panelists in this front and also the floor - would like to have some of the opinions on how we can continue or what is the important aspect of continuing with these programs in a fruitful manner in the future.

Dr. Le Viet Dung

Thank you. Just yesterday we had a roundtable discussion on FOLENS achievement and we all recognized that FOLENS, you just know that Dr. Gomi summarized and we all think for the future network and today for me, again just my thinking, not recommendation that I found myself under support from MEXT 17 Japanese universities receive support doing environment education, for example FOLENS in TUAT, APIEL in The University of Tokyo and SLER in Yokohama National University, and I think now 17 projects already implemented, just at the foundation and we need to go up to the top like any project getting within three universities, you have very good achievement. So, how to link, I first would learn how to link between three universities and how to link in all together 17. I think that question may be bring to MEXT but because I am leaving tomorrow, my last recommendation is TUAT will discuss on that and we can share what we have done. 'How to link and how to go further step, as Professor Takada mentioned that the link will not die, I hope TUAT will be considering that to link three first and all together 17. Thank you.

Dr. Tiwa Pakoktom

Good evening everybody. I am Tiwa from Kasetsart University, Thailand. For my opinion for prospect for the future, in the level of Thailand, I would like to say I can keep the research because we already have E and R base in

Thailand. Now, we had a project from TRF (Thailand Research Fund) to get the money to do the research in terms of environment, especially in my case I got the economy crops, which is important for Thai government and Thai people, and also I mentioned yesterday in the roundtable meeting, we would like to keep the connection by FOLENS alumni in Thailand and also we will extend our project to TUAT alumni in Thailand also, which now we have already established more than 3 or 4 years before. In the future, I would like to say if the TUAT has another project, I will give some detail in the comment that environment is not just only for the between around us, but important thing is that we also might extend the project, especially in the global warming, nobody mentioned about this one but I think it's the big project that we can extend to that one, and I would like to thank, the last year for FOLENS, I would like to thank TUAT again, Professor Takada and staff to invite Kasetsart University, and we would like to make more cooperation with other FOLENS members, many professors, Professor Yoneda, Professor Terada and other universities also cooperated with Kasetsart University. Thank you very much.

Dr. Takashi Gomi

Thank you. Okay, we are going to continue.

Dr. John Ofosu-Anim

Thank you very much. I think yesterday at the roundtable discussion we had with the FOLENS administrators, we shared our views with them as to how to move beyond FOLENS and I indicated that for now we have established some links with the staff of TUAT and think we can proceed by strengthening the linkage. We are now looking at solving the environmental problems that we have created. I want us in moving forward to step back a bit and look at the causes of these environmental problems. During the presentation by the Professor from Yokohama National University, he spoke about commitment and also that we should have expertise and leadership. Though we have all these we still create environment problems. Moving forward I will also add that we as scientists should also identify the causal agents and try to prevent or manage them before the problems arise.

We also realized that we in the developing countries have peculiar problems. One of the gentlemen who was here presented his experience with FOLENS, he showed a dumping site in Japan and that in Thailand and I think the same goes for my country Ghana. The difference between managing garbage in a developed and developing countries are different which may be due difference in the economic situation and levels of education in these countries. Our governments have also a role to play in educating the citizenry about protecting the environment. Once again, I would like to thank FOLENS for the opportunity to be here with you, and as I said yesterday, the FOLENS agenda will 'not die'.

Dr. Takashi Gomi

Thank you very much professors. We have some comments from the professors. This comment actually - if we are looking at it - can be classified as three levels about continuity of the programs. As John-sensei mentioned, there are environmental issues around the world. This is among the countries or within the regions programs, which is a motivation for compassions for this continuity as the environmental leaders.

The second issue from Professor Dung seventen universities can be unified to continue these programs within Japan and for this to continue. We have also some joint meeting of 17 universities in September and that will also be one of the motivations to continue these programs. Also, as Tiwa-sensei suggested this is another level, this may be the student levels or not students, if graduate it's leaders network for this alumni's network within Thailand or among these different countries or between Japan and other countries. So, this can be the continuity of these programs in the future. I would like to have some comment on the continuity. Kobayashi-sensei mentioned some compassions or expertise or the leadership of the continuity of the programs. So, I would like to have some comments and how we can develop this, including the schemes in these programs and the continuous program and after this FOLENS program.

Dr. Masanori Kobayashi

Okay, thank you very much. I really concur with remarks made by a lot of colleagues and just follow-up to Professor Tarao's comment about this 5 years' duration, other countries are investing into the human resources for 10 years, 20 years, long-time perspectives, why do we keep changing it every 5 years? Why do we have to stop it? One thing we did was to try to promote stakeholder dialogs, so last September 23rd, we had public symposium at the United Nations University and we had invited business leaders, we had invited political leaders, the Chairman of the House of Representatives Environment Committee, Mr. Yoshioka originally from Fukushima Prefecture but I guess now he is elected from Shimane or somewhere in the western part. So, one thing, I think, we should have done better is to try to demonstrate the achievement and the potential of this university's leadership development program for environmental sustainability and to the business people or to the political people, politician, decision makers, I think many other people in the construction industry, they are doing it but somehow environmentalists are so gentle that we just focus only on work and they don't think – money will come anyway but others they lobby a lot to get money, secure the funding, I think we are missing it. So, one thing - if I may suggest promoting stakeholder dialog on environmental leadership development program, I think this is very important.

Secondly, I think Tokyo University of Agriculture and Technology has a distinctive focus on this field, and I think we should not lose it and I often tell that we should focus on the linkages between policy, science, stakeholders of field, so if we can reinforce the education and research program on the linkages between field, science, policy, maybe we can make a better appeal to the public that our program has much greater potential.

The third point is same for our university and I don't know if university here has it but we need a center and one university, Virginia Tech of the USA, they have a center called the Center for Leadership in Global Sustainability, so they have created this kind of center, I am not sure how many faculty members and staff are working there but doesn't matter. You first create it. You have to first sell the concept. You have to sell these ideas to the people. Our university president told me, "Kobayashi-sensei, we can do that if you get extra money," but if you go to the education ministry, they tell me that you invest first and then we'll consider giving extra money, so it's a chicken and egg question and if it's chicken and egg question, then why don't we make a small step first to catalyze some extra funding but again I am not necessarily at the position to influence decisions of the universities, but I always wish that somebody who wants to learn environment they say, "Oh, we go to Japan to study the environment." I hope the time would come like that in Japan technology country, finance countries, but when they think of studying environmental science, maybe they

think that, "Oh, let's go to Sweden or let's go to Germany." But I hope Japan can be named as a country best equipped to learn, do the research about environmental sustainability, and if you look around, I just came back from Sendai about this Asia conference on national parks, and the local ecologists, they are saying that they are struggling to stop the construction of dyke that will completely destroy the coastal ecosystems. The dyke is supposed to protect the cities from the tsunami that may happen once every 100 years. They want to construct the dyke that has a height of 14 meters. It's like a baseball back screen. If you look at it, you cannot see the ocean and all houses are now getting relocated to the hilly areas and nobody is going to live anywhere, so why are we building this dyke and all the marine ecosystems they are warning that they may be lost in a few years but we hope that we can keep it – the language is different, we must keep it. We must protect it for the future generations, so I thought that the people are so gentle and nice and they don't want to confront with other people who are also driving. I understand that they may be in a social political setup where they cannot freely express their views, but at the same time, if we don't really stand up and raise our voice, we may lose it.

If you think about this radioactive waste contamination, we are going to host Olympic 2020, at that time many people said that message was not properly conveyed in terms of the status of this radioactive contamination control in this country. So, Japan has to do more to be a frontrunner of protecting the environment and promoting sustainability, and if we don't do that, we cannot really keep talking about developing environment leaders for the sake of just sustaining our occupation and salary. This should not be the case as Professor John mentioned. We have to create an agent for change for greater sustainability. Otherwise, we cannot sustain. So, I hope we can still make further conceptual transformations to create more substantive partnership supported education and research program. Thank you.

Dr. Takashi Gomi

Thank you very much. Any questions from the audience if you have? Anything?

Kobayashi-sensei summarized some of the importance of the strategies and then also the concept and conceptualization of this study, and I would like to also hear some opinions of Professor Katayama-sensei about maybe some of the strategies or concept for development in the case of the University of Tokyo.

Dr. Hiroyuki Katayama

First, I'd like to say that this is my opinion. I am coming here on behalf of University of Tokyo but I will talk about my opinion, not the University of Tokyo opinion.

The environmental leadership education, I think we can utilize this chance to give students some bird view of the environmental problems and taking the whole issue and the individual students have their own research topic by which they can get the insect eye. I think both the bird view and the insect eye are important, and then this program and the environmental leadership program was a very good tool for us to make the bird view, so that even though this is related to research of whichever, such educational training was necessary for the students to be really motivated to do

their own research, so it was very nice. The students can be motivated, then automatically they will create better research result and this is very happy for both students and professors.

To continue this kind of project, 5 years is too short and we have similar problem all the time and I have many things to appeal to the ministry, but here to be very dry if we have only 5 years, what shall we do? One thing is that we should take benefit without any sacrifice of the research project. The students will get benefit. I am fine with that and some family members will use their own time but if our students get enough benefit, then just fine and the problem is maybe the project, research project, associate professor or such a person, so that if we can give more effort or more free effort to any other research then we can manage the pathway or career to the tenure but if the Ministry of Education is always trying to manage all the effort time of the project researchers, then we have to sacrifice such young and very promising researchers, so that's the biggest weak point, I think. So, we should have a better system for that, and if we can solve that part, of course 5 years is not enough, but if there is no sacrifice by people and everybody is accepting the situation, then this project was better to have it, so I persuade myself like that.

I'd like to add one small thing about the businessperson. Maybe we are not good negotiators but we could only get from the three companies to donate our program, one is Nissan company, another is Coca Cola, and the third one was Daiwa Shoken. They gave us a lot of money but it's not enough for us to continue the project, just to allow the student to go a little bit and we invited some younger employees of that company to attend our unit or something like that. We have a collaboration but that was not enough and the continuity is not sold so easily and the collaboration with business sectors, and at the moment under the economical situation in Japan, we cannot do that so easily at the moment.

Dr. Takashi Gomi

Thank you very much.

Well then, could you go ahead, Professor Sakai

Dr. Kenshi Sakai

I am Kenshi Sakai. I am a faculty member of this program but this is first time for me to attend the symposium from the past four symposiums, but it was so impressive for me. Also, I am very much optimistic to the future prospect of FOLENS because I learned through this symposium a lot– I am an agricultural engineer, therefore I am not a specialist of environmental science and as environmentalist to deal with environmental science is quite disciplinary event, in that case to solve the problem, leadership is needed. That leadership is not commander-type leadership. Everybody – all the stakeholders should show their leadership. That part is quite important. That is what I learned from this symposium from you.

To promoting to learning based organization, same strategy will be useful like leadership. As Tarao-sensei mentioned this, we didn't have president in here but maybe our president believed we can take care of this for our future prospect. We already know how to do that. Other faculty members show our leadership - each individual or such students may show their leadership and through that we can do that. Money is maybe important but not necessary.

What is important thing is we know how to use our money. In order to know how to use the money efficiently, we need infrastructure. To develop the infrastructure, one of the important infrastructures is network and friendship and know each other. We already have it, 17 universities, so all 17 universities are also well known institutions and universities of the world. So, the 5 years was short but we are very happy to get such kind of infrastructure. Thank you very much. That's why I am very much optimistic.

Dr. Takashi Gomi

Thank you very much Sakai-sensei. From these perspectives, Katayama-sensei provided that the bird view is important for the educational programs and Sakai-sensei view can be related to some of the money issues, maybe we don't need to get so much money but maybe as Kobayashi-sensei suggested we can make a center or something and then without limiting effort, then they can probably appeal for this program as a strategy for the societies and also other countries as the environmental leader programs and unfortunately actually the simultaneous interpreting is going to finish, but we would like to have some comments and questions and if you want to say something and at this moment, we would like to hear from the students also and also maybe the panelists want to talk a little more.

Dr. Mohamad Pauzi Zakaria

Sorry to take some of your time. I always believe that there is always light at the end of the tunnel after FOLENS. Okay, I am speaking in my own opinion as well, may not be representing my university but what's going on in the university is because I am staff of the university, I have a few things to mention. There is a new initiative for funding in my university. If money is concerned, somebody said money is important, funding is not important but I think money is a vehicle for us to move. UPM provides scheduled funding. You put your money on the table, so show me your money then we show you our money in 1:1 ratio, so for example you give us project for ¥2 million, then we also can provide ¥2 million, so in total we have ¥4 million.

In the past, we were talking about one-way traffic, much of the usually money come from Japan. We just provided minimum amount of physical infrastructure to run the program, so this time we have a new initiative because the environmental awareness in our country is increasing. We have many followers, especially young people. They like to be involved in environmental education, environmental field survey because environmental science is no rocket science. It's a fundamental science but easy for people to follow and of course people talk about the current issues, always talk about environmental science, so the government is now looking at Ministry of Science and Technology Environment has enough funding they gave because it is top priority in our country so the money trickled down to the university to do research, and we should take this opportunity to bring forward what we have been fighting for. We had established - FOLENS has been an excellent program for staffs, students, society at large. Post FOLENS program, no doubt we have to continue it. FOLENS has taught us about field-oriented skills for student and staffs. My students and I have especially benefited a lot from this program in the past 5 years and interestingly by having participated in FOLENS, I notice that the things that students learned through FOLENS cannot be possible in classrooms situation. Field work and expeditions are real-life experiences, which is FOLENS all about. FOLENS is among the best programs we ever had in our university. It has provided an excellent platform for building a complete scientific worker and future generations, so with that I think there is no question about stopping from here, it's just the

beginning, so we have to let it continue, whichever way we want to do it, we have to discuss like one of the professors here talking that stakeholders' meeting. Stakeholders' meetings are very important because there are different views, different aspects we may not see this view before, but other people give very important aspect of the view, so we can survive whatever difficulties we have in our pathway. Thank you.

Dr. Takashi Gomi

Thank you very much. I think time is coming up, so before finishing up, I would like to show you this – I think some of this might be the broader – a bird view perspective and we have been working quite a bit about the different types of programs from this local or field oriented or general specific or regionals or global. This diagram is actually modified during the environmental leaders symposium we had in last September, but this is specifically modified at our universities and different colors are indicating different perspectives, and for this field oriented we have been specifically focusing on the specific or regional things but to develop this we need to have some broader aspect to join this together, so this program can be continuous in many, many aspects after the FOLENS program.

The other important aspect that we learn from the collaboration from this E & R Bases members, this is actually the link between these universities is like Sakai-sensei mentioned Kurumaza and this Kurumaza diagram we have a special design for the interdisciplinary course. We need to have maybe social skills and then through discussions we have some institutional programs for a longer timescale. This is really important for this perspective.

This is connecting the major study and FOLENS-minded programs, so after finishing we can continue FOLENS-minded programs, and through this network it's not only the Kurumaza, it's probably the crosslinks programs among these universities and also not only TUAT and other 17 universities within Japan or other university for this young base. Overall, this program for this symposium today - of course this is important for the human resources for the special – like the FOLENS has really taken effort for ongoing this important program, we would like to continue of course working with FOLENS staffs, FOLENS professors and also keeping motivation sustainable for these programs. This is important for the educational networks. This is the beginning as Pauzi-sensei mentioned and then we continue to update and upscale in the future and this may be bringing up a synergy effect as environmental leaders, and as continuing this we have discussing the alumni networks and also we have some centers but university can be the center but we are hoping that all of these individuals as environmental leaders become centers itself. So, this is most important to become environmental leaders in other countries or around the world. So, I think we would like to wrap up this panel discussion. Thank you very much all the panelists from this front and also the floor and thank you very much all the audience for participating in this symposium. Thank you very much. I would like to close this.

6-9-3. プレゼンテーション演習 / Outline of Presentation Skill Training

「プレゼンテーション演習」は、毎年秋の国際シンポジウムに併催して行われる恒例行事です。本演習は、ガーナ、ベトナム、マレーシア、タイ、中国に設置された海外研究教育拠点（E&R ベース）から来日される先生方と、生の英語で議論することが、最大の特徴です。

留学生を含め、参加学生の大部分は英語 Native ではありませんので、毎回、学生のみなさんは発表前は不安があるようです。英語での説明や受け答えに苦労しながらも、始まってみると熱心な応答が行われ、各自手ごたえを感じつつ、自信を深めているように思われます。また、農工大学生と海外拠点の先生方との関係がいっそう密になる場でもあります。これらの先生方に、発表時間後の講評会で、関連内容に関する情報や、より良いポスター作りのアドバイスももらいます。

いずれにしても、自分の研究内容を、機会あるごとに公表することは、研究結果を客観的に見つめ直し、科学的に何をどこまで言えるか考える有効なものだと思われます。また、環境問題は地域個々のスケールから地球環境問題まで連鎖的に関係をもちますので、社会の国際化が進んだ今日、国内外での議論や検討、協力体制に貢献できる能力を培うことが大切でしょう。（尾崎宏和／Hirokazu Ozaki）

The Presentation Skill Training is our annual autumn event held simultaneously with an international symposium. The biggest feature of this training is that students have discussions in English with faculty members from the FOLENS's overseas E&R Bases located in Ghana, Vietnam, Malaysia, Thailand, and China.

Most of the participating students, including international students, are not native English speakers and become anxious leading up to their presentations. However, once their presentations have started, while struggling in the presentation and Q&As, they quickly build up confidence and find themselves absorbed in lively discussions. This opportunity also allows students of the Tokyo University of Agriculture and Technology and faculty members from our overseas bases establish a closer relationship. During the post-presentation feedback, the faculty members give students relevant information and tips for preparing effective posters.

Presenting their own research findings in public at every opportunity is useful for students to review objectively their findings and determine the extent of their capability for scientifically discussing their findings. Local- and global-scale environmental problems are linked. In this increasingly globalized era, an important thrust is to cultivate students' abilities for contributing to domestic and international discussions, investigations, and cooperation.

海外教育研究拠点の先生との議論／Discussion with E&R base faculty member

コアタイムの後、海外教育研究拠点の先生より講評を受ける／Receiving advice and suggestion from E&R base faculty members after the core-time

7 FOLENSの5年間を振り返って

Reflections on Five Years of FOLENS

7. FOLENSの５年間を振り返って / Reflections on Five Years of FOLENS

はじめに

環境問題はその地の社会背景や人々の生活文化と密接に関わるため、問題が存在する現地の価値観や社会事情に基づく認識と科学体系的な対応がなされる必要があります。一般則を理解しつつ、その場の特殊事情に応じ、問題に関与する多様な利害関係へ柔軟に対応することが求められます。例えばアジア・アフリカ地域で生じる問題の解決には、アジアやアフリカのその地域の事情を広く理解することがまず大切です。しかし、今日における社会の情報化は、現地に行かず現場の事情を知らずとも、環境問題のデータや知識を断片的に入手することを可能とし、一部の視点による判断を生んだり、思考を狭め適切な解決策を提示できなかったりすることが危惧されます。実際、環境問題を含む様々な問題は、世の中という常に動き続ける「現場」で発生するものであり、書籍や映像、インターネットといった二次情報だけでは、「現場」の最先端の実情理解には及びません。また、現在の大学院教育は、特定の専門領域を、深く詳細に問うことが大きな地位を占めており、専門領域以外への応用力には乏しい人材を育てかねないとも考えられます。以上は「アジア・アフリカ現場立脚型環境リーダー育成プログラム（Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa 以下、FOLENS プログラム）」の問題意識の原点です。FOLENS は、現場状況を様々な観点から体験することが、問題への真の対応をもたらすものとして、「現場立脚」と「俯瞰的な視野」をキーワードに、環境問題解決に貢献できる人材の育成をめざしてきました。

FOLENS プログラムは、このような目標をもって 2009 年より実施の準備が開始され、2010 年 4 月に開講しました。FOLENS 事業が区切りを迎える今、その後の評価を把握しておくことは、今後農工大において、上記の理念をいっそう発展させ定着させるために有意義であると考えられます。また、プログラム運営に直接関わってきた一個人として、反省点や効果の点を役立てることにもつながります。そのため FOLENS へ協力いただいた教員と FOLENS に参加した学生を対象に、調査した評価結果を本節で述べ、「FOLENS のふりかえり」としたいと思います。

教員の声

FOLENS 協力教員には、「学生への教育としての意義」、「学生の各スキル向上に対する FOLENS の貢献」、「大学院専攻と FOLENS の並行履修における効果と課題」、「教員自身に対する効果」に関してアンケート調査を行いました。さらに、FOLENS プログラムの成果と課題、今後の本学における定着に関して自由な意見交換・認識共有をはかるため、グループインタビューを実施し、2 名の教員の協力を得、筆者を含む 3 名の FOLENS 特任教員が参加しました。この内容は、アンケート結果と合わせ教員の声として整理しました。

実際には、教員アンケートへの回答は、回答数は 8 通で十分とはいえず、さらに、本プログラムを好意的に評価される教員のみが返送した可能性も否めません。しかし、その回答の大半は肯定的な声で、これは本学教員内における見解の一部であり、FOLENS プログラムへの一定の支持を示すとも言えます。以下では、数は多くないとはいえ寄せられた回答から得られた評価や課題を紹介します。

まず、示された課題としては、ゼミや授業などと FOLENS プログラムの時間的な重複です。これは教員アンケートの全回答が「ある程度」または「非常にあった」を選択しました。さらに、『FOLENS への参加により学生の研究がおろそかになる』は「ある程度」と、「ほとんど無い」「わからない」の合計で半々、『研究のため学生は FOLENS に参加できない』は「ある程度」と「非常に」を合わると半数以上に達しました。同様の指摘は教員へのインタビューでもなされており、多くの学生は FOLENS と研究室活動の両立に苦労したこ

とが、教員にも明らかに伝わってきます。

一方で FOLENS カリキュラムの効果については、FOLENS が提供する学習機会そのものの意義や学生への教育効果、FOELNS と研究（専門分野）の関連など大半の回答は良好な評価でした。FOLENS での教育が将来において環境問題に貢献しうる人材の育成につながるとの期待もうかがわれます。

FOLENS プログラムの特徴の一つである英語の使用に関しては、8 回答とも英語力向上を認め、英語使用を含むコミュニケーション能力の向上に関しても高評価でした。つまり FOLENS は、実用ツールとしての英語を用いた意志伝達力を培う場になったと思われます。実際、FOLENS への参加当初と比べ今の方が英語がうまくなったと思える学生が、日本人だけでなくアジア出身の留学生を含め少なくありません。逆に、FOLENS で得た技能、知識、視点が研究の充実などに役立つとの回答は 6 割強と他よりも低い数値でした。この結果は専門分野等への即時的効果よりもコミュニケーション能力を含む中長期的なフィードバックへの期待と合致するのではないでしょうか。

教員へのグループインタビューでは、“FOLENS 学生間の連帯感”も話題となりました。学生は、国内外の現場実習で遭遇する困難を、自分たちで協力して克服していきます。そういった FOLENS での現地体験は、専門分野の枠組みを越え、より深い関係や広い視点を築くことになったでしょう。この議論は、他分野経験や俯瞰的な視野は、自身の専門分野に対して知識と自信をもってこそ生かされるとの指摘に至りました。すなわち FOLENS は、大学院での分野横断型教育プログラムであるからこそ、各々が自分の専門分野を掘り下げる過程で周辺分野の重要性を認識し、多様性を吸収する、といった相補的な学びが大切なのでしょう。この認識へ至ったことは、FOLENS 実施自体の効果だと私は思いますし、それ以上に、私自身の「教育現場体験」にもとづく大きな学びです。

履修学生の声

FOLENS 学生への聞き取りは、修了前にプログラムの活動を振り返るかたちとし、これも 1 回あたり 4〜6 名ほどのグループでのインタビューとして行いました。まず、FOLENS プログラムに参加するにあたり期待した点は、「日本国外（アジア・アフリカ）での現場経験」、「環境問題の理解」、「国際交流」などが多く挙げられました。プログラムを履修することで実際に得られた成果は、異なる文化や専門性を背景とする他学生や教員、学外の専門家や地元住民との環境問題に対する新たな視点を得ることができたと、多くの学生が述べました。さらに、環境問題に関する現場の状況や人々の意見や考え、社会的背景や影響について理解が深まった、現場に身をおくことの重要性について認識できた、異文化・異分野に対する認識や理解が深まった、コミュニケーション力が向上したとする声も目立ちます。学生は、FOLENS プログラムへの参加によって異なる国や地域、異なる分野、さらに学外の「現場」と出会う場を新たにもったといってよいでしょう。さらにいえば、通常の大学院の専攻教育で得られる知識や技術のみならず、異文化・異領域の理解、環境問題への関心といった視野の広がりをもたらしたと推測できます。

この事は、学外での経験に基づくものだけでなく、学内すなわち他専攻の学生との交流の効果も含まれます。そして、学内外問わず、自分の専門分野を説明する必要が生じ、自分の分野を改めて学ぶ機会となったり、その後の自信や責任感の醸成につながったりしています。このように、“外に出て人と会う”ことは、その時に求められるコミュニケーションの力といった応用力を育成し、学生間や、学外の多様な人々との新たなネットワークの構築をもたらす効果をもっています。

こうした多様な力の育成や広範なネットワークの構築は、学生が修了後、現場で活動する際の大きな支えともなります。「現場立脚型」を軸とする FOLENS にとって「現場」は重要なキーワードですが、「現場」を

「知識の対象（現場についての教育）」、「教育の場（現場を通じた教育）」のみならず、「持続可能な社会へ向けて行動する場」ととらえ、現場での行動を促進する「現場のための教育」の重要性も指摘されています。FOLENS は、従来の専門教育だけでは成し得ない、こうした「現場のための教育」を実現する一手段ともなっているのでしょう。

一方で、学生はこれら効果を認めながらも、教員の声と同様に、専攻での研究との内容的両立や、多分野性による相互理解の困難を指摘しています。例えば、授業レベルに対しては、「低すぎる」と「高度で理解できない」という双方の声があります。関連して、従来の専門科目を多分野の学生に提供するのでなく、多分野学生を対象とした分野横断型科目を新たに構築する必要性や、事前学習の指示、授業アンケートの頻回実施といった改善も提案されました。FOELNS での活動と専攻での研究や学習が関連しないとの不満も聞かれ、さらに、FOLENS と専攻での活動が時間的に重複すること、それが各学生でまちまちであるのでグループワーク等の時間調整がきわめて困難であるという問題も、多くの学生が共通して指摘している問題です。後者の指摘は、それによってプログラムの講義や実習等への参加学生数が減少し、それが学生の参加意欲をいっそう低下させるという構造的な問題に帰着します。このように、アドオンプログラムと専攻教育が効果的に連携できていないことの問題は大きく、カリキュラムや指導の工夫、さらに大学全体としてのシステム上の工夫が改善策として求められます。

教員と学生で共通して、コミュニケーション力の必要性の認識や、その鍛練の機会となったとの指摘は多くありました。逆に、教員からは、コミュニケーション力に加え今後の研究面へのフィードバックを期待するに対する声が多く、留学生からはより即応的な技術や知識などに関する効果が挙げられ、日本人学生からは現地理解や国際協力に関する指摘が目立ち、立場によって違いがみられたのは対比的といえました。

これからの FOLENS へ

環境問題に対し有意義な貢献のできる人材とは、諸問題の相互関連性の認識や、立場の違いによる利害の差異へ当事者意識をもち対応するなど、的確な対応策を見出すための想像(Imagination)と創造(Creation)の能力が求められるでしょう。これらは、「現場立脚」の経験を重ね中長期的に養われるものと思われます。

FOLENS を履修した学生や、協力を賜った教員への調査では、現地体験やコミュニケーション力など中長期的な効果を FOLENS に対して期待する声が多いと総括できます。教員に対しては、教育手法を広げる機会になったともされ、また、FOLENS に対しては各教員、学内外の各分野をつなぎ連携を促すことが求められた。さらには、中長期的な効果を期待するとして一般論を並列・概観し知識や視点を植え付ける教育を行うのでなく、基盤となる自分の分野を持ち、その一層の理解や有効な応用のためにも、周辺関連分野との関連を認識することが大切だとの点をあぶり出したと言ってよいでしょう。この点は、近年いわれる、環境分野で国際的に役割を果たす人材が求められる「T 字型」の能力を、どのように育成するかという課題に対し示唆を与えると、私は思います。

一方で、このような分野横断型のカリキュナムの充実を、既存専攻と共存しながらどのように進めていくか、今後の農工大が取り組むべき課題点や改善可能な点も少なくありません。学生の専攻での研究活動と FOLENS の活動の両立や、多数の専攻にまたがる FOLENS 学生どうしのつながりを確保するといったソフト的な面に加え、大学全体でのシステマティックな点も多いのが現状です。例えば、野外実習での安全管理は、とくに海外実習に関して FOLENS 独自で手探りし、それが現在全学的な対応に波及しつつあるのは成果です。しかし、留学生の受け入れに関する奨学金の獲得、入試事務などは、学内の一部局であった FOLENS だけでは対処しきれない課題であると感じられます。留学生の来日前後の支援では、所属予定の指導教員へどうし

ても負担をかけました。指導教員と FOLENS での立場の違いによるダブルスタンダード的な対応も生じかねず、今後、大学として方針や手続きの方法を明確化するなど、システム整備を進めることが、FOLENS を含む類似プログラムの円滑実施や効果向上につながると考えられます。将来的には、プログラムをアドオンや他専攻履修でなく、専攻横断の正規カリキュラムとして実施するのが良いのではないでしょうか。いずれにせよ、FOLENS 実施の経験は農工大全体で共有し、今後の教育と研究の進展や、人材の輩出に有効に活用してほしいと願っています。

とはいえ、この 4 年間で大きな問題も事故もなく、成果を生み出し課題を抽出できたことそれら全体が、FOLENS の成果といってよいはずです。この場を借りて、FOLENS プログラムの実施にあたり惜しみないサポートをいただいた学内外および海外教育研究拠点の教職員と学生諸氏、学外協力者に御礼申し上げます。

Introduction

Environmental problems are closely related to the social backgrounds of the site and people's lives, and cultures. Hence, problems should be recognized based on the local values and circumstances of society; response should be scientific and applied in a systematic manner. Consequently, future leaders are therefore required to understand the general principles, consider the particularity of locations, and respond flexibly to various interests related to problems. To address the environmental problems in the Asian and African regions, for instance, an important requirement is a comprehensive understanding of the situation of these regions. Obtaining snippets of data and knowledge on environmental problems, without actually going to the field to learn the local circumstances, has been made possible these days by advances in the computerization of society. However, a concern arises in relation to judgments being made based on only one point of view, in which case appropriate solutions cannot be proposed to avoid perpetuating a narrow perspective. Indeed, various issues, including environmental problems, are seen in the "field" where circumstances are constantly changing. Such secondary information as obtained from literatures, movies, and the Internet would not bring about true understanding on the status of the "field." In addition, as the current graduate school education places its major emphasis on in-depth and detailed investigation on a specific area of study, a possible result is that graduate schools are educating students who may lack the practical skills to apply their knowledge to any area outside their specialized domain. These abovementioned points are the origin of the critical awareness of the "Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa" (FOLENS program). The FOLENS program has aimed at training human resources who can contribute to the solution of environmental problems, with the idea that experiencing actual circumstances in the field in various perspectives would bring about such skills for them to respond to the problems effectively. Under the FOLENS program, the emphasis is on "field-oriented and comprehensive perspective."

Preparation for the FOLENS program began in 2009 with the objectives mentioned above, and the program was launched in April 2010. As the FOLENS program draws nearly reaches its conclusion, I think that it would be meaningful to pay attention to the program evaluation conducted afterwards in order to develop the principles mentioned above and ensure that the said principles take root in the Tokyo University of Agriculture and Technology (TUAT). In addition, as a member of the administration office directly involved in program management, I can utilize this opportunity to apply these positive points as well as those that merit our reflection. Therefore, I would like to address the results of the evaluation in this section, which targeted those faculty members who cooperated with

FOLENS and the students who participated in the program, and thus present “reflections on FOLENS.”

Voices of the Faculty Members

A questionnaire survey was conducted for the faculty members who cooperated with the FOLENS program as regards the “significance of the program in educating students,” “contribution of FOLENS to the skills development of students,” “effects and problems of the simultaneous participation of students in the graduate program and FOLENS,” and “effects for the faculty member.” Furthermore, a group interview was conducted to facilitate the exchange of opinions and sharing of recognition related to the program’s establishment in the university in the future; two faculty members and three FOLENS special faculty members, including the author, participated in this session. The contents of this report were organized along with the results of the questionnaire as voices of the faculty members.

The questionnaire for faculty members had eight responses, which was not sufficient. We do not discount the possibility that only those who evaluated the program favorably responded to the questionnaire. Most of the responses were positive about the program, which comprised a part of the opinions of the faculty members showing a certain level of support for the FOLENS program. In the following part of the report, the evaluations and problems raised in the responses will be introduced.

Firstly, one of the problems indicated was the overlap in schedule of the FOLENS program with other seminars and lectures. The faculty members selected choices of either “to some extent” or “very much.” Furthermore, half of the responses to the question whether “participation in FOLENS hindered the research of the students” were “to some extent,” “not really,” or “don’t know,” and more than half of the responses to the question whether “the students should not participate in FOLENS because of their research” were “to some extent” and “very much.” Similar points were indicated in the interview with the faculty members, who clearly indicated that most of the students had a difficult time participating in the FOLENS program while conducting their research activities.

Meanwhile, in relation to the effects of the curriculum of FOLENS, most of the responses have shown positive evaluations on the significance of the educational opportunity provided by FOLENS, educational effects to the students, and connection between FOLENS and research (specialized field). Some expectations indicated that education in FOLENS would lead to the development of human resources who could contribute to the solution of environmental problems.

As for the use of English, one of the characteristics of the FOLENS program, all responses reflected high evaluations, thus recognizing the students’ progress in English language skills as well as improvement in communication skills, including the use of English. In other words, the respondents thought that FOLENS has given an opportunity to train students’ communication skills for them to deliver their thoughts and ideas using English as a practical tool. Indeed, quite a few students, both Japanese and international students from Asia, thought they became better in English after participating in FOLENS. On the contrary, the responses stating that the skills, knowledge, and perspectives obtained in FOLENS would be helpful for the improvement of research were less than 60% of the total responses, lower than that in other points of evaluation. This result may correspond to the expectations on the medium- to long-term effects, such as improvement of communication skills, rather than the immediate effect on the specialized fields.

In the group interview with the faculty members, “the feeling of solidarity among FOLENS students” was one of the topics raised. Students overcame difficulties in domestic and foreign practical trainings by cooperating with one

another. Such experience in the field acquired in the FOLENS program must have built closer relations and wider perspectives beyond the framework of the students' respective field of specialty. This discussion led to the indication that experience in other fields and comprehensive perspectives would be maximized only when knowledge and confidence in their own specialized fields had been established. In other words, as FOLENS is an interdisciplinary educational program in graduate school, students must learn to recognize the significance of related fields of specialty and understand the diversity in the process, in which each student deepens one's field of specialty. I think that this outcome is an effect of implementing the FOLENS program; in my case, this recognition may have been the biggest learning from the "educational experience in the field."

Voices of the Participating Students

The survey on FOLENS students was organized in such a way as to facilitate their reflections on the program activities before graduation, and it was also conducted as group interview with about four to six participants in each group. Such points as "field experience outside of Japan (Asia and Africa)," "understanding of environmental problems," and "international exchanges" were raised as part of their expectations prior to participating in the FOLENS program. In identifying actual outcomes gained from participating in the program, many students pointed out that they acquired new perspectives on environmental problems from other students, faculty members, as well as experts from outside the university and local communities who had different backgrounds in culture and specializations. Other opinions indicated that the students were able to "have deeper understanding on the status of the field, opinions and ideas from various people, as well as social backgrounds and influences in relation to environmental problems," "recognize the importance of being in the field," "have a deeper understanding and recognition of different cultures and different fields of specialty," as well as "improved their communication skills." The students thus had the opportunity to encounter the "field," such as different countries and regions, different fields of specialty, and other ventures outside the university campus, by participating in the FOLENS program. Moreover, the program could be attributed to have engendered wider perspectives, such as understanding of different cultures and different fields of specialty and attracting interests in environmental problems, which were beyond the knowledge and techniques they could have gained through the specialized education in a normal graduate school.

The above effects applied not only to experience outside the university but to that of exchanging from other fields of specialty within the same university. Whether inside the university campus or not, the need arose to explain one's field of specialty, bringing about an opportunity to learn one's specialty again and nurture one's confidence and sense of responsibility. As described above, to "meet people out in the field" had an effect of developing skills application, such as communication skills, and of facilitating the building of new networks with various people among students and outside the university campus.

Such development of various skills and building of wider networks would provide great support when students start working in the field after graduation. "Field" is an important keyword to FOLENS, whose core value is to be "field oriented." The importance of "education for the field" was also indicated to facilitate actions in the field, considering "field" not only as "the object of knowledge (education about the field)" and "the field of education (education in the field)" but also as "the area to act on for a sustainable society." FOLENS has become one of the measures to realize such "education for the field," which cannot be accomplished by conventional education on specialty alone.

Although the students recognized these effects, they pointed out their difficulty in studying subjects different

from their research and understanding others from different fields of specialty, similar to what the faculty members indicated. For example, in terms of the difficulty level of the lectures, opinions were divided between “too low” and “too high to understand.” Further, the FOLENS program proposed to develop interdisciplinary subjects of study targeting students from various fields, enhance prior learning, and conduct frequent questionnaire surveys on the lectures. Some complaints stated that the activities in FOLENS and research and study in their own major were unrelated. Other problems common to many students were that the activities in FOLENS and in their own major overlapped in schedule, and that managing time for group work proved difficult as each student had his or her own schedule. The latter point points to a structural problem, where the number of students’ participation in the program lectures and practices constantly decreases, which further lowers their motivation to participate in the program. As discussed above, the lack of coordination between the add-on program and the specialized curriculum causes a major problem. Hence, fully worked-out plans are required in the curriculum, system of supervision, as well as university system as a whole to improve the situation.

Common to both the students and faculty members, many have pointed out that they had an opportunity to recognize the necessity of communication skills and to train those skills in the program. However, a difference was observed in the expectations of the different parties. A number of the faculty members expected more feedback on future research apart from the improved communication skills. International students expected more learning on the latest technologies and immediate knowledge, whereas Japanese students expected more emphasis on the field and international cooperation.

Picture of the Future for FOLENS

Imagination and creativity are required for human resources who can render meaningful contributions to environmental problems. With these capabilities, future leaders could help identify precise countermeasures by recognizing the co-relations of various problems and coping with the different interests of different parties. These capabilities can be nurtured in a medium- to long-term timeline, through the repetition of “field-oriented” experiences.

Many people expected medium- to long-term effects from the FOLENS program, such as field experience and communication skills, judging from the investigation on the students and faculty members who cooperated in the program. The program was recognized as an opportunity to develop the educational techniques of faculty members, and FOLENS was requested to facilitate the connections and coordination among various faculty members and fields of specialty. Moreover, the program emphasized the importance of recognize the relations of one’s own specialty with related fields of study, as well as expecting medium- to long-term effects, to establish a solid base in one’s own specialty, deepen one’s understanding on one’s own field, and apply gained knowledge efficiently, all of which are beyond the scope of conventional education of utilizing and observing general principles and offering knowledge and perspectives. I think that it has given some suggestions on how to develop the “T-shaped” ability, which is recently said to be required for those who will contribute to environmental sectors worldwide.

Meanwhile, a number of problems and practices may need to be improved. For instance, TUAT should work on how to develop an interdisciplinary curriculum that allows existing major programs to run simultaneously. In addition to soft side issues, such as helping students become involved in the FOLENS program while managing their research activities in their major fields of study and securing connections among FOLENS students from various specialties, many issues on the system of the university as a whole have been identified. For example, in relation to the outcome of

the program, safety management in field practices was originally developed by the FOLENS program, particularly for overseas training, and is currently applied throughout the different courses in the university. However, certain issues, such as scholarships for international students and administration of entrance examination, were challenges that could not be dealt only in FOLENS, as these were parts of the university's administration. Potential supervisors of the international students had their work cut out for them in relation to supporting international students before and after arriving in Japan. In some situations, faculty members faced difficulties brought by the difference of their positions as supervisors and as FOLENS members, which resulted in double standard-like correspondences. Developing a system management scheme, through which university policies and relevant procedures are clarified, would lead to the smooth execution of programs similar to FOLENS and improve future outcomes. In the future, I think it would be wise to conduct the program as a regular interdisciplinary curriculum, not as an add-on program or a study of another specialty. In any event, I hope that the experience of the FOLENS program will be widely shared in TUAT as a whole and will be effectively utilized for future education and research development to produce a higher number of talented graduates.

In sum, we could count the FOLENS as having produced a great outcome: apart from the absence of major problems and accidents, this four-year period has brought wonderful results and yielded solutions. I would like to use this opportunity to thank the faculty members of TUAT and other universities as well as those from overseas Education and Research Bases, along with the students and everyone outside the university who generously supported the execution of the FOLENS program. (尾崎宏和／Hirokazu Ozaki)

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海外教育研究拠点からのメッセージ / Message from Chinese Research Academy of Environmental Sciences (E&R base)

李 发生（中国環境科学研究院 教授） / Fasheng Li (Professor, Chinese Research Academy of Environmental Sciences)

現場立脚型環境リーダー育成拠点形成事業（FOLENS）は、大学院生を対象に、「現場センスと現場技術」を育成し、環境問題を的確に判断して有効な対策を提案する力を育てることで、アジアやアフリカの地元の人々と協力しながら持続可能な開発を実現しようというプログラムでした。FOLENS プログラムは日本人だけでなくアジアやアフリカからの留学生も対象とし、東京農工大学で行われました。毎年のシンポジウムは、プログラムの成果と課題が議論され、その後の一層の進展にむけて方向性を見出す場となりました。

2010 年、中国環境科学研究院（CRAES）は FOLENS の「海外教育研究拠点（E&R base）」およびコーディネーターオフィスとなったことを喜ばしく思います。そして我々は、FOLENS 学生の実習を受け入れ、工業汚染サイトの調査、実験室での作業や講義を行いました。

中国環境科学研究院では、大規模な機材や分析機器が 20 種以上あり、どれも FOLENS の方々に使用していただけます。FOLENS との今後の協力を歓迎します。私たちは、FOLENS に感謝し、我々はこのプログラムから非常に多くのことを学びました。

Education Program for Field-Oriented Leaders in Environmental Sectors in Asia and Africa (FOLENS), is a special program offering a curriculum with two targets: to train postgraduate students to serve as leaders with "field-oriented" mind and skill sets, to cultivate their ability to identify environmental issues and to propose effective measures for achieving sustainable development while working in cooperation with local stakeholders in Asia and Africa. This program focused on students from Japan and abroad, particularly Asia and Africa, was organized and launched by Tokyo University of Agriculture and Technology (TUAT). There is an annual international symposium to improve this program, to analyze and summarize the members' development, to discuss next working plan.

In 2010, Chinese Research Academy of Environmental Sciences (CRAES) was honored the "Education and Research Bases (E&R Bases) and Coordinator Offices of FOLENS". Our base successfully accepted one FOLENS student, the activities of which include investigation of industrially contaminated sites, laboratory work and lecture.

In CRAES, more than 20 large installations and analytical instruments are open for FOLENS. We welcome the future cooperation with FOLENS. We appreciate FOLENS and we have learned very much from this program.

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Tiwa Pakoktom（タイ カセサート大学講師） / Tiwa Pakoktom (Lecturer, Kasetsart University, Thailand)

カセサート大学（ KU ）は、土地利用の状況、土地利用の変化、林業の環境への影響について研究しています。 そして KU の研究者は、タイでのそれらの問題に関する様々な研究プログラムに積極的に関わっています。FOELNS の E&R ベースとしての活動は、主に次の 3 つでした。1 つめは、灌漑水田における気象データ採取です。2010 年 7 月 10～15 日に高さ 6m の観測塔を水田に設置し、8 月 1~6 日に気温、風速、風向き、正味日射計、雨量計、相対湿度を測定する機器を取り付け、以後観測を続けています。2 つ目の活動は、RQflex10 という機材を使用して過酸化水素（H_2O_2）を測定し、東京の空気と濃度を比較することです。3 番目は、カセサート大学内の灌漑用水路、自然河川、池の水について pH と EC を測定することです。

Kasetsart University (KU) realizes the enormous impact of Land use, land-use change and forestry (LULUCF) on environment. KU researchers have been active on various research programs that contribute to better understanding of relations between land-use and environment in Thailand. Activities at E&R base Thailand including of 3 main activities. First activity is conducting the weather data in an irrigated paddy rice field. On the 10th-15th July 2010, the 6 meters tower was build and then 1st-6th August 2010 we installed some instruments on the tower such as air temperature, wind speed and wind direction, net radiometer, rain gauge and relative humidity. Second activity is H_2O_2 sampling by using RQflex10 to compare the concentration with the air in Tokyo. Third activity is analyzing the water quality by using pH and EC portable meter from 3 different sources including irrigation canal, natural river and pond in Kasetsart University.

8

おわりに

Closing Remarks

8．おわりに―これからの現場立脚型環境リーダー / Closing Remarks: Field-oriented Leaders in Environmental Sectors in the Future

環境リーダー育成プログラムが実施されてきた、この５年間を振り返ると、東京農工大においても様々な新たな国際的なリーダー育成に向けた教育プログラムも実施されるようになってきた。まさに、「使命志向型教育研究」（MORE SENSE）を基本理念とした東京農工大において、工学と農学及びその融合領域における自由な発想に基づく教育から、環境問題に対する課題を解決できる高度な人材育成が、FOLENS のプログラムを起点として進められ、発展してきたと実感する。

５年間での国際的な環境リーダー育成プログラムが発展する一方で、この５年間には、さまざまな環境、農業、社会システムの問題が、新たに顕在化してきた。2011 年の東日本大震災以降、災害からの復興、農村社会基盤の整備の在り方、環境中への放射性物質対策と地域の持続的資源管理、エネルギー利用の在り方など、多くの新しい環境分野の課題が、我々の前につきつけられた。震災後の問題に対して、日本人学生と留学生は、国内問題のみとしてではなく、各国における次世代農業環境課題として、どのように解決していくのか？などを現場からの視点で考える機会となった。また、世界各国では、極端気象により豪雨豪雪や渇水などの災害や水資源や水質管理など問題も顕在化し、社会の持続的発展、食糧や水の安全供給などのレジリエントな地域や国土計画の在り方、生態系管理などについての課題への取り組みの重要性が大きくなり、変貌する社会で生じる農業や環境問題について、如何に即応的に対応し、対策を立案していくことが重要となっている。このような課題の顕在化や将来動向を考えると、環境リーダー育成プログラムで進めてきた、現場における環境や農業課題に関するニーズをくみ上げ、現場から上がってくるデータを解析評価し、現場のニーズと環境問題の現状を正確に把握することの重要性は、これまでの５年間より、これからの５年間で、より大きくなることが予想される。加えて、問題は、ますます複雑化しており、俯瞰的な視野を持った問題解決のための対策技術や政策を提言する能力が要求されている。FOLENS での５年間での人材育成の修了生は、現場立脚型の人材として、社会からの期待も大きくなり、その重要性は、今後より高くなることが予想される。

育成プログラムは本報告書が示すように 5 年間で、目標として挙げた育成人数が達成した。東京農工大を中心とした国内の連携機関、海外教育研究拠点が人材育成プログラムとして強化されるとともに、拠点間の連携も強化され、「車座的な横断ネットワーク」に発展している。更に、プログラム修了生とのネットワークが形成され、これらを持続的に進めることにより、世界各地で発生する現場の課題について即応的に教育へ取り入れ反映できるシステムも構築できると思われる。育成プログラム通しての、学生の「学び」のみならず、大学教員がお互いも理解を深め、教育研究についての共通理念を持つに至ったことは、JST からのサポート終了後も、全学プログラムとしての継続していくことのみならず、本プログラムが社会変化に対応できる今後の教育研究組織つくりにおける大きな礎になったと考えられる。

しかし、環境リーダー育成プログラムの持続的な実施は、必ずしも容易ではない。本プログラム５年間のもう一つの重要な資産としては、環境リーダー育成センター専任スタッフで培ってきた、人材育成プログラムのコンテンツやノウハウである。プログラムは実質的に継続されるものの、これらの大きなソフト資産を学内にいかに浸透させていくのかについては、現在進行形の他の国際的教育プログラムなどとの有機的な連

携を通して、実質化していく必要がある。また、海外拠点との連携を続ける上でも、発展的な教育プログラムの実施とともに、科研費等の外部資金獲得を積極的にとり組み、教育研究拠点として発展させいく必要もある。

FOLENS のプログラムによる学府や専攻を超えた教育連携により、アジア・アフリカ地域を含む現場立脚型リーダーの育成拠点が、東京農工大に形成された。アジア・アフリカ地域をリードする技術者、研究者、教育者の育成が実質的に進められるようになっている。今後、FOLENS の「修了証明書」がより価値あるものとなるためには、修了生を継続的にサポートするとともに、東京農工大学が、教育研究機関として環境や農業分野をリードし、現場立脚型リーダーの育成を継続するとともに、これらの人材が継続的に社会で活躍することが重要であることを、改めて感じている。

2014 年 3 月　環境リーダー育成センター　副センター長　五味高志

Looking back over the past five years since the Education Program for Field-Oriented Leaders in Environmental Sectors started, a variety of new educational programs for training international leaders have been implemented at TUAT. I strongly feel that an advanced level of training of human resources that can solve environmental issues has been implemented and developed by the FOLENS program as a starting point under the concept of education founded on flexible ideas in engineering, agriculture and their interdisciplinary fields at TUAT, the philosophy of which is “Mission Oriented Research and Education giving Synergy in Endeavors toward a Sustainable Earth (MORE SENSE).”

While the past five years have witnessed the development of the international education program for leaders in environmental sectors, various problems in environmental, agricultural and social systems have become evident. In the wake of the Great East Japan Earthquake of 2011, we are faced with many new environmental issues, including post-disaster reconstruction, finding a desirable way to improve rural infrastructure, measures to deal with radioactive materials in the environment, and sustainable resource management in the region, as well as an ideal form of energy use. These issues present us with opportunities to view, from a field perspective, how Japanese and international students would solve the problems—not only as domestic issues—but also as future agricultural environmental issues. In many countries of the world, extreme weather-related disasters including heavy rains, heavy snowfalls and droughts—as well as issues related to water resources and water quality management—are raising concerns. Consequently, it has been becoming more and more important to tackle issues such as the development of resilient regional and national plans that focus on sustainable development, realizing a secure supply of food and water, and management of the ecosystem. Under these circumstances, it is important for us to respond promptly to the agricultural and environmental problems that are emerging in a time of social change, and to formulate plans to deal with the problems. Considering these emerging issues and future trends, the processes we have been emphasizing in the education program for leaders in environmental sectors, specifically, taking into consideration the needs of the field as related to environmental and agricultural issues, analyzing and evaluating data obtained from the field, and accurately identifying the needs of the field and the current situation regarding environmental issues, are expected to become more important over the next five years than they were over the past five years. Furthermore, the issues facing us are more complicated than ever,

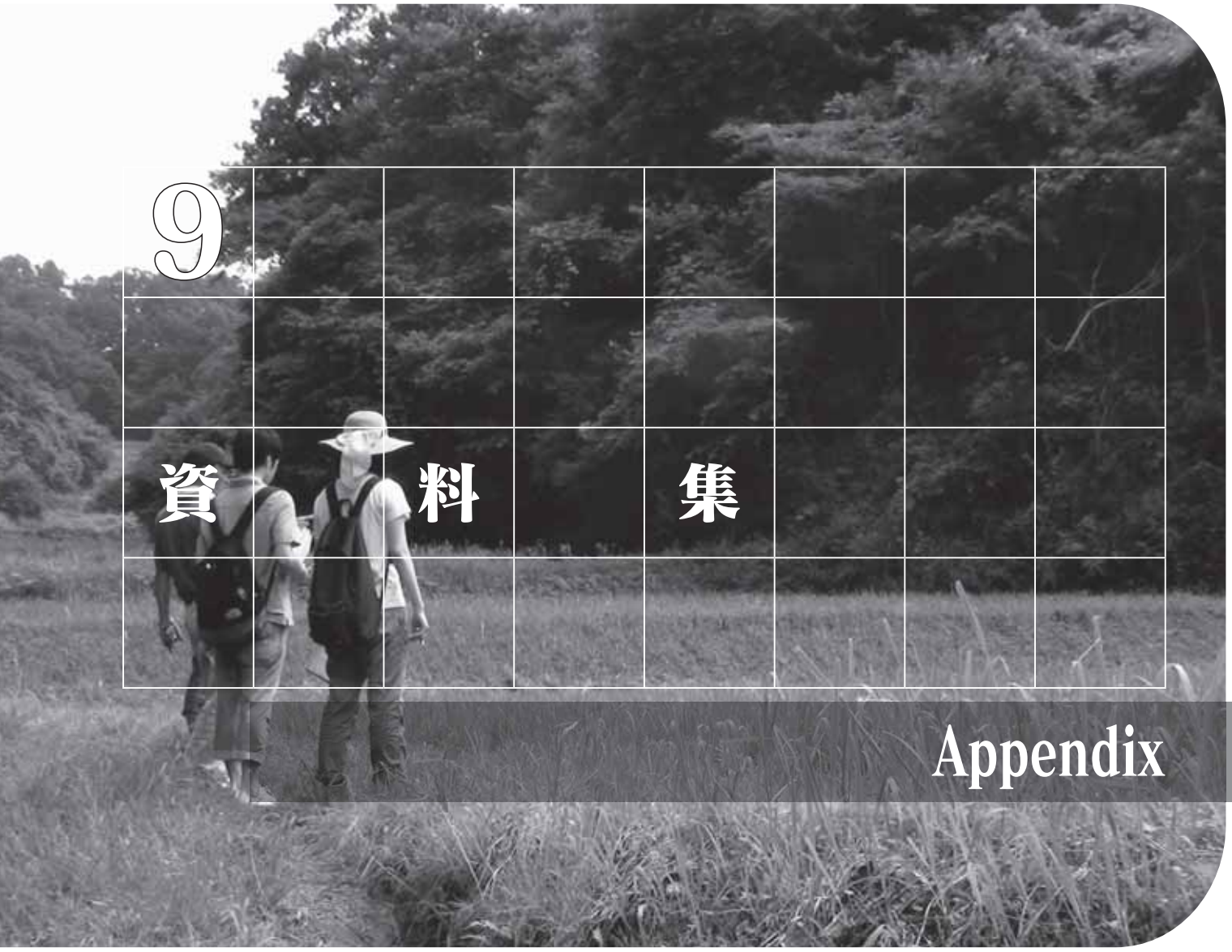
requiring skills to propose technical measures and policies for solutions to problems from a broader viewpoint. Students who complete the five-year human resource training program offered by FOLENS are expected to be valued more in the future as field-oriented human resources.

As shown in this report, the education program for leaders has achieved the target number of persons who completed the program as of the end of the five-year period. The program has been reinforced by TUAT and other cooperative organizations in Japan as well as the FOLENS Education and Research Base universities. Collaboration among the institutions has been further strengthened, and has developed into a "sitting-in-a-circle" type cross-sectional network. In addition, a network of students who have completed the program has also been established. By promoting our movement, it is considered possible that we can construct a system that will enable the incorporation of the real-life problems encountered at various work sites in the world into the education program in a timely manner. Not only students who studied in the education program for leaders, but also the instructors of the university have deepened their mutual understanding of academic disciplines and have, as a result, achieved a sharing of a common philosophy in educational research. This will enable us to continue the program as a whole-school program, even after the completion of the period of support by JST; and furthermore, it is a huge advantage for us to have formed a base for creating an educational research organization that is capable of responding to social change.

However, it is not always easy to continue the education program for leaders in environmental sectors. One of the important assets of the five-year human resource program is its contents and know-how, which were developed by the staff of the Center of Education for Leaders in Environmental Sectors. While the program itself is continuing, it is also necessary to determine how to have this valuable know-how permeate throughout the college, and put into practical use working in a coordinate fashion with other ongoing international educational programs. In order to maintain good cooperative relationships with international institutions, it is important to develop our program into an educational and research hub by working on fundraising projects such as Grant-in-Aid for Scientific Research in a more proactive manner.

Transdisciplinary, trans-faculty educational cooperation through FOLENS has formed an educational base in TUAT for field-oriented leaders covering the Asian and African regions. The program enables the training of leader technicians, researchers, and educators in a practical manner. In order for the Certificate of Completion in the FOLENS program to be even more valuable, I feel that it is important for TUAT to continuously support students who complete the program, as well as to take a leadership role in environmental and agricultural fields as an educational research organization, and continue to be involved in the training of field-oriented leaders, and above all, for the students from the program to continuously play active roles in society.

Takashi Gomi
Deputy Director, FOLENS
March 2014



9 資料集

Appendix

実施体制 | メンバー

○= member, ● =admin. assistants

CN=China, GN=Ghana, ML=Malaysia, TL=Thailand, VN=Vietnam

東京農工大学　担当教員

氏名	所属等	担当講義等	運営委員会	入試WG	ｶﾘｷｭﾗﾑWG	海外拠点WG
環境リーダー育成センター						
高田　秀重	環境リーダー育成センター　センター長 農学府　物質循環環境科学専攻　教授	環境科学特別講義Ⅱ：海洋プラスチックの環境化学、環境計測評価実習	◎	○	○	◎ML
細見　正明	環境リーダー育成センター　副センター長 工学府　応用化学専攻　教授	環境化学工学特論Ⅱ：水／排水処理工学	○	○		○ CN
五味　高志	環境リーダー育成センター　副センター長 農学府　国際環境農学専攻　准教授	地域環境計画学、国際環境農学課題別演習	○		◎	
米田　健一	環境リーダー育成センター　特任准教授 （ラボコーディネーター）	物質生物計測講座特別講義Ⅲ：グリーンテクノロジー特論、システム化学工学講座特別講義Ⅳ：技術英語表現法、グリーンテクノロジー実習、FOLENS セミナー	○	○	○	○
二ノ宮リム　さち	環境リーダー育成センター　特任准教授 （チーフコーディネーター）	農村社会調査実習、インターンシップ＆ケーススタディーワークショップ、FOLENS セミナー	○	○	○	○
尾崎　宏和	環境リーダー育成センター　特任助教 （ラボコーディネーター）	環境計測評価実習、海外フィールド実習＆ポストフィールド報告会、FOLENS セミナー	○	○	○	○
農学府／連合農学研究科						
向後　雄二	農学府　農業環境工学専攻　教授	環境修復保全学				
藤井　義晴	農学府　農業環境工学専攻　教授	地域持続生物生産技術学				
豊田　隆	農学府　国際環境農学専攻　教授	地域開発政策学				
木村園子　ドロテア	農学府　国際環境農学専攻　准教授	生物資源循環利用学、国際環境農学課題別演習		○		○ TL
竹内　郁雄	農学府　国際環境農学専攻　准教授	国際開発協力論				
渡邊　裕純	農学府　国際環境農学専攻　准教授	水環境評価学、国際環境農学課題別演習				
加藤　亮	農学府　国際環境農学専攻　准教授	水利環境保全学				
山田　祐彰	農学府　国際環境農学専攻　講師	環境農業協力論、農村社会調査実習、国際環境農学課題別演習				
及川　洋征	農学府　国際環境農学専攻　助教	農村社会調査実習、国際環境農学課題別演習				
伊豆田　猛	農学研究院 物質循環環境科学部門　教授	環境生物学特別講義Ⅰ：植物に対する越境汚染物質の影響	○			
片山　葉子	農学研究院 物質循環環境科学部門　教授	環境生物学特別講義Ⅲ：環境微生物学				
楊　宗興	農学府　物質循環環境科学専攻　教授	環境化学特別講義Ⅰ：地圏環境科学				
大地　まどか	農学府　物質循環環境科学専攻　准教授	環境生物学特別講義 IV：海洋環境科学				
木庭　啓介	農学府　物質循環環境科学専攻　准教授	環境化学特別講義 III：生態系生態学				
多羅尾　光徳	農学府　物質循環環境科学専攻　准教授	環境生物学特別講義Ⅱ：生態系管理学、環境計測評価実習			○	○ VN
渡邉　泉	農学府　物質循環環境科学専攻　准教授	環境化学特別講義Ⅳ：森林生態系の環境毒性学				
酒井　憲司	農学府　農業環境工学専攻教授	生態情報学特論				
澁澤　栄	農学府　農業環境工学専攻教授	農業環境工学特別講義Ⅰ：精密農業保全				
斎藤　広隆	農学府　農業環境工学専攻准教授	土壌環境保全学特論				
服部　順昭	農学研究院 環境資源物質科学部門　教授		○			
船田　良	農学府　環境資源物質科学専攻　教授		○	○		
降旗　信一	農学府　共生持続社会学専攻　准教授	共生教育論				
原　宏	農学府 名誉教授	地球大気化学：その科学と哲学				

辻村　秀信	農学府　生物制御科学専攻 准教授	生物新機能開発学				
濱野　國勝	農学府　シニアプロフェッサー	地域生物機能利用学				
工学府						
銭　　衛華	工学府　応用化学専攻　准教授	化学エネルギー工学特論Ⅱ：触媒・微粒子工学				
寺田　昭彦	工学府　応用化学専攻　准教授	環境化学工学特論Ⅱ：水／排水処理工学	○		○	
亀山　秀雄	工学府　産業技術専攻　教授	物質生物計測講座特別講義Ⅳ：環境産業ビジネス論				
神谷　秀博	工学府／生物システム応用科学府 (BASE) 先端生物システム学部門　教授	化学エネルギー工学特論Ⅱ：触媒・微粒子工学				
WULED LENGGORO	工学府／生物システム応用科学府 (BASE) 先端生物システム学部門　准教授	化学エネルギー工学特論Ⅱ：触媒・微粒子工学				
小原　重信	客員教授	物質生物計測講座特別講義Ⅳ：環境産業ビジネス論				
その他						
川端　良子	国際センター　准教授	地球環境論	○			
Siaw Onwona-Agyeman	共生科学技術研究院　准教授					○ GN
河井　栄一	客員教授、アジア科学教育経済発展機構					○

事務担当者（T：チーム、TL：チームリーダー、SC：サポートセンター）

氏名	所属等		運営委員会	入試 WG	ｶﾘｷｭﾗﾑ WG	海外拠点 WG
村田　昇一	学務部長		○			
松本　健生	学生総合支援課　学務係長		●		○	
今井　賢	教育企画課		●			
前田　亜美	教育企画課		●			
小宮　冬紀	教育企画課		●		○	○
井村　俊明	入試課 課長補佐		●	○	○	
久保田　ちづる	入試課		●	○		
疋田　陽子	国際交流課		●			
仲　陽子	国際交流課		●	○		○
河田　直人	府中地区学生支援室 室長				○	
大西　純子	府中地区学生支援室		●	○	○	
高崎利世子	小金井地区学生支援室		●		○	
横田　有理香	小金井地区学生支援室			○		
柴　　雅和	大学院連合農学研究科		●			
三浦　如絵	大学院連合農学研究科		●	○	○	
杉山　智恵子	環境リーダー育成センター		●	○	○	○
常定　雅子	環境リーダー育成センター		●	○	○	○
布山　陽介	環境リーダー育成センター		●	○	○	○
島田みづほ	環境リーダー育成センター		●	○	○	○
田矢　亜希	環境リーダー育成センター		●	○	○	○

海外教育研究拠点（E&R Base）担当教員

氏名	所属等
ガーナ大学（ガーナ）	
John Ofosu-Anim	E&R Base オーガナイザー 農学・消費者科学部農学科副学科長 穀物学専攻長 准教授
Edward Benjamin Sabi	技術科学部　農業工学科　講師

マレーシア・プトラ大学（マレーシア）	
Mohamad Pauzi Zakaria	E&R Base オーガナイザー 環境学部 副学部長
Ahmad Zaharin Aris	環境学部　環境科学科　上級講師
Mohd. Nazli b. Naim	食品加工工学部　工学府
カセサート大学（タイ）	
Poonpipope Kasemsap	E&R Base オーガナイザー 国際センター所長 農学部作物栽培学科准教授
Samakkee Boonyawat	副学長（研究担当）
Tiwa Pakoktom	農学部　作物栽培学科　講師
Piyapong Tongdeenok	農学部
カントー大学（ベトナム）	
Le Viet Dung	E&R Base オーガナイザー 副学長（国際関係担当）准教授
Nguyen Hieu Trung	環境自然資源学部　学部長
Nguyen Huu Chiem	環境自然資源学部　副学部長
Nguyen Van Be	環境自然資源学部　環境自然資源管理学科　学科長
Nguyen Van Cong	環境自然資源学部
Nguyen Dinh Giang Nam	環境自然資源学部
Huynh Vuong Thu Minh	環境自然資源学部
中国環境科学研究院（中国）	
Fasheng Li	E&R Base オーガナイザー 土壌汚染制御研究部門 教授
Hong Hou	土壌汚染制御研究部門 教授

Organization | Members

○= member, ● =admin. assistants

CN=China, GN=Ghana, ML=Malaysia, TL=Thailand, VN=Vietnam

TUAT Faculty

Name	Title, Center/Department	Subjects	Steering Committee	Admission WG	Curriculum WG	E&R Base WG
FOLENS Head Office (Center of Education for Leaders in Environmental Sectors)						
Hideshige Takada	Director, FOLENS Professor, Dept. of Environmental Science on Biosphere, Faculty of Agriculture	Environmental Chemistry of Marine Plastics (Special Lectures on Environmental Chemistry II), Training for Environmental Data Acquisition and Assessment	Chair	Chair	○	Chair/ ML
Masaaki Hosomi	Deputy Director, FOLENS Professor, Dept. of of Applied Chemistry, Graduate School of Engineering	Water/Wastewater Engineering (Advanced Chemical Environmental Engineering Ⅱ)	○	○		○ CN
Takashi Gomi	Deputy Director, FOLENS Associate Professor, Dept. of International Environmental and Agricultural Science	Regional Environmental Conservation Planning, Subjective Exercise for International Environmental and Agricultural Research	○		Chair	
Kenichi Yoneda	Associate Professor and Coordinator, FOLENS	Advanced Green Technology (Special Lecture on Analysis Science Ⅲ), Technical English (Advanced Systems Chemical Engineering IV), Green Technology Practice, FOLENS Seminar	○	○	○	○
Sachi Ninomiya-Lim	Associate Professor and Chief Coordinator, FOLENS	Fieldwork in Rural Communities, Internship and Case Study Workshop, FOLENS Seminar	○	○	○	○
Hirokazu Ozaki	Assistant Professor and Laboratory Coordinator, FOLENS	Training for Environmental Data Acquisition and Assessment, Overseas Field Training and Post-Field Reporting Seminar, FOLENS Seminar	○	○	○	○
Graduate of Agriculture (Graduate School of Agriculture/ United Graduate School of Agricultural Science)						
Yuji Kohgo	Professor, Dept. of International Environmental and Agricultural Science	Environmental Rehabilitation and Conservation				
Yoshiharu Fujii	Professor, Dept. of International Environmental and Agricultural Science	Regional Sustainable Bio-Production Science				
Takashi Toyoda	Professor, Dept. of International Environmental and Agricultural Science	Rural Development Policy				
Sonoko D. Kimura	Associate Professor, Dept. of International Environmental and Agricultural Science	Utilization of Sustainable Biological Resources, Subjective Exercise for International Environmental and Agricultural Research		○		○ TL
Ikuo Takeuchi	Associate Professor, Dept. of International Environmental and Agricultural Science	International Development and Cooperation				
Hirozumi Watanabe	Associate Professor, Dept. of International Environmental and Agricultural Science	Aquatic Environmental Assessment, Subjective Exercise for International Environmental and Agricultural Research				
Tasuku Kato	Associate Professor, Dept. of International Environmental and Agricultural Science	Environmental Water Use & Conservation				
Masaaki Yamada	Lecturer, Dept. of International Environmental and Agricultural Science	International Cooperation on Sustainable Agriculture, Fieldwork in Rural Communities, Subjective Exercise for International Environmental and Agricultural Research				

Yosei Oikawa	Assistant Professor, Dept. of International Environmental and Agricultural Science	Subjective Exercise for International Environmental and Agricultural Research, Fieldwork in Rural Communities				
Takeshi Izuta	Professor, Dept. of Environmental Science on Biosphere	Effects of transboundary air pollutants on plants(Special Lectures on Environmental Biology I)	○			
Yoko Katayama	Professor, Dept. of Environmental Science on Biosphere	Microorganisms in Earth Environments (Special Lectures on Environmental Biology III)				
Muneoki Yoh	Professor, Dept. of Environmental Science on Biosphere	Terrestrial Environment (Special Lectures on Environmental Chemistry I)				
Madoka Ohji	Associate Professor, Dept. of Environmental Science on Biosphere	Marine Environment (Special Lectures on Environmental Biology IV)				
Keisuke Koba	Associate Professor, Dept. of Environmental Science on Biosphere	Ecosystem Ecology (Special Lectures on Environmental Chemistry III)				
Mitsunori Tarao	Associate Professor, Dept. of Environmental Science on Biosphere	Ecosystem Management (Special Lectures on Environmental Biology II), Training for Environmental Data Acquisition and Assessment			○	VN
Izumi Watanabe	Associate Professor, Dept. of International Environmental and Agricultural Science	Environmental toxicology on forest ecosystems (Special Lectures on Environmental Chemistry IV)				
Kenji Sakai	Professor, Dept. of Environmental and Agricultural Engineering	Advanced Ecological Informatics				
Sakae Shibusawa	Professor, Dept. of Environmental and Agricultural Engineering	Precision Agro-conservation (Special Lecture on Environmental and Agricultural Engineering I)				
Hirotaka Saito	Associate Professor, Dept. of Environmental and Agricultural Engineering	Advanced Soil and Water Conservation				
Nobuaki Hattori	Professor, Dept. of Natural Resources and Eco-materials		○			
Ryo Funada	Professor, Dept. of Natural Resources and Eco-materials		○	○		
Shinichi Furihata	Associate Professor, Dept. of Studies in Sustainable and Symbiotic Society	Symbiotic Education				
Hiroshi Hara	Emeritus Professor, Faculty of Agriculture	Global Atmospheric Chemistry: Its Science and Philosophy				
Hidenobu Tsujimura	Associate Professor, Dept. of International Environmental and Agricultural Science	Improvement of Biological Functions				
Kunikatsu Hamano	Senior Professor, Faculty of Agriculture	Utilization of Regional Biological Functions				
Faculty of Engineering (Graduate School of Engineering/ Graduate School of Technology Management)						
Eika Qian	Associate Professor, Dept. of of Applied Chemistry	Catalytic and Fine Particle Processing Engineering (Advanced Chemical Energy Engineering Ⅱ)				
Akihiko Terada	Associate Professor, Dept. of of Applied Chemistry	Water/Wastewater Engineering（Advanced Chemical Environmental Engineering Ⅱ）	○		○	
Hideo Kameyama	Professor, Department of Industrial Technology and Innovation,Graduate School of Technology Management (MOT)	Business Creation and Management for Environmental Industries (Special Lecture on Analysis Science IV)				
Hidehiro Kamiya	Professor, Graduate School of Bio-Applications and Systems Engineering (BASE)	Catalytic and Fine Particle Processing Engineering (Advanced Chemical Energy Engineering Ⅱ)				

WULED LENGGORO	Associate Professor, Graduate School of Bio-Applications and Systems Engineering (BASE)	Catalytic and Fine Particle Processing Engineering (Advanced Chemical Energy Engineering Ⅱ)				
Shigenobu Ohara	Visiting Professor	Business Creation and Management for Environmental Industries (Special Lecture on Analysis Science IV)				
Other Faculties						
Yoshiko Kawabata	Assosiate Professor, International Center	Global Environment	○			
Siaw Onwona-Agyeman	Associate Professor, Institute of Symbiotic Science and Technology					GN
Eiichi Kawai	Visiting Professor/ AsiaSEED					○

TUAT Administrative Staff

Name	Title, Team	Steering Committee	Admission WG	Curriculum WG	E&R Base WG
Syoichi Murata	Director for Dept. of Educational Affairs	○			
Kensei Matsumoto	Section Chief, Student Support Section	●		○	
Ken Imai	Manager, Dept. of Educational Planning	●			
Ami Maeda	Manager, Dept. of Educational Planning	●			
Fuyuki Komiya	Dept. of Educational Planning	●		○	○
Toshiaki Imura	Admissions Department, Associate Dept Manager	●	○	○	
Koushi Miyajima	Admissions Team	●	○		
Yoko Naka	International Exchange Promotion Dept	●	○		○
Naoto Kawata	Student Support Section Chief, Fuchu Campus			○	
Masaki Sakuraba	Associate Dept Manager for International Exchange Promotion & Section Chief for International Student Service Section	●	○		
Junko Ohnishi	Student Support Section, Fuchu Campus	●	○	○	
Riyoko Takasaki	Student Support Section Chief, Koganei Campus	●		○	
Nozomi Takazawa	Student Support Section, Koganei Campus		○		
Masakazu Shiba	United Graduate School of Agricultural Science	●			
Yukie Miura	United Graduate School of Agricultural Science	●	○	○	
Chieko Sugiyama	Administrative Coordinator, FOLENS	●	○	○	○
Masako Tsunesada	Administrative Assistant, FOLENS	●	○	○	○
Yosuke Fuyama	Administrative Assistant, FOLENS	●	○	○	○
Mizuho Shimada	Administrative Assistant, FOLENS	●	○	○	○
Aki Taya	Administrative Assistant, FOLENS	●	○	○	○

Faculty at Education and Research Base (E&R Base)

Name	Title, Department/Faculty
University of Ghana	
John Ofosu-Anim	Organizer, FOLENS E&R Base/ Associate Professor/ Head, Crop Science/ Vice-Dean, School of Agriculture, College of Agriculture and Consumer Sciences
Edward Benjamin Sabi	Lecturer, Agricultural Engineering Department, Faculty of Engineering Sciences
University Putra Malaysia, Malaysia	
Mohamad Pauzi Zakaria	Organizer, FOLENS E&R Base/ Professor and Coordinator, Center of Excellence for Environmental Forensics, Deputy Dean, Faculty of Environmental Studies
Ahmad Zaharin Aris	Senior Lecturer, Department of Environmental Sciences, Faculty of Environmental Studies
Mohd. Nazli b. Naim	Department of Process and Food Engineering Faculty of Engineering
Kasetsart University, Thailand	
Poonpipope Kasemsap	Organizer, FOLENS E&R Base/ Director, International Studies Center/ Associate Professor, Department of Agronomy, Faculty of Agriculture
Samakkee Boonyawat	Vice President for Research
Tiwa Pakoktom	Lecturer, Department of Agronomy, Faculty of Agriculture
Piyapong Tongdeenok	Faculty of Agriculture
Can Tho University, Vietnam	
Le Viet Dung	Organizer, FOLENS E&R Base/ Vice Rector for International Relations/ Associate Professor
Nguyen Hieu Trung	Dean, College of the Environment and Natural Resources
Nguyen Huu Chiem	Vice Dean, College of the Environment and Natural Resources
Nguyen Van Be	Head, Department of Environmental and Natural Resource Management, College of the Environment and Natural Resources
Nguyen Van Cong	College of the Environment and Natural Resources
Nguyen Dinh Giang Nam	College of the Environment and Natural Resources
Huynh Vuong Thu Minh	College of the Environment and Natural Resources
Chinese Research Academy of Environmental Science (CRAES),China	
Fasheng Li	Organizer, FOLENS E&R Base/ Research Professor,Department of Soil Pollution Control
Hong Hou	Professor,Department of Soil Pollution Control

FOLENS 履習学生一覧／FOLENS Students

	氏名	入学	修了年月	課程	国籍	学府・専攻	専攻
1	LI Sen 李森	2009.04	2012.6	博士	中国	生物システム応用科学府	生物システム応用科学
2	Long Zhao	2009.10	2012.9	博士	中国	工学府	応用化学
3	Rinawati	2009.10	2012.9	博士	インドネシア	連合農学研究科	環境資源共生科学
4	Pheng Sokline	2009.10	2011.9	修士	カンボジア	農学府	国際環境農学
5	Bessy Kho Sze Ee	2009.10	2011.9	修士	マレーシア	農学府	国際環境農学
6	Tungsomkid Jameekorrn	2009.10	2011.9	修士	タイ	農学府	国際環境農学
7	Pham Anh Thi Quynh	2009.10	2011.9	修士	ベトナム	農学府	国際環境農学
8	Roueurn Siranet	2009.10	2011.9	修士	カンボジア	農学府	国際環境農学
9	利谷翔平	2010.04	2013.3	博士	日本	工学府	応用化学
10	Shaofeng Gong 龔紹峰	2010.04	2013.3	博士	中国	生物システム応用科学府	生物システム応用科学
11	島田幸治郎	2010.04	2013.3	博士	日本	連合農学研究科	環境資源共生科学
12	福家光敏	2010.04		博士	日本	連合農学研究科	生物生産科学
13	上原歩	2010.04	2013.3	博士	日本	連合農学研究科	生物生産科学
14	近藤圭	2010.04	2012.3	修士	日本	農学府	国際環境農学
15	渡辺智也	2010.04		修士	日本	農学府	国際環境農学
16	牧田朋子	2010.04	2012.3	修士	日本	農学府	物質循環環境科学
17	Ei Ei Thein	2010.04	2012.3	修士	ミャンマー	農学府	国際環境農学
18	Timilsina Govinda Narayan	2010.04	2012.3	修士	ネパール	農学府	国際環境農学
19	山口智弘	2010.04	2012.3	修士	日本	農学府	国際環境農学
20	Chutteang Cattleya	2010.10	2013.9	博士	タイ	連合農学研究科	環境資源共生科学
21	Dung Bui Xuan	2010.10	2013.9	博士	ベトナム	連合農学研究科	環境資源共生科学
22	Rola S.O. Mahmoud	2010.10	2014.3	博士	パレスチナ	連合農学研究科(茨城大学)	環境資源共生科学
23	Prathomrak Na-Ngern	2010.10	2012.9	修士	タイ	農学府	国際環境農学
24	Zhiqiu Xiao	2010.10	2012.9	修士	中国	農学府	国際環境農学
25	NAM Sooyoun	2010.10	2012.9	修士	韓国	農学府	国際環境農学
26	PyoneWin Win	2010.10	2012.9	修士	ミャンマー	農学府	国際環境農学
27	Aung Zaw Oo	2011.04	2014.3	博士	ミャンマー	連合農学研究科	生物生産科学
28	周東直毅	2011.04		修士	日本	農学府	環境資源物質科学
29	伊東万木	2011.04	2013.3	修士	日本	農学府	物質循環環境科学
30	棚澤理奈	2011.04	2013.3	修士	日本	農学府	物質循環環境科学
31	Yeo Bee Geok	2011.04	2013.3	修士	マレーシア	農学府	物質循環環境科学
32	沼尻勇太	2011.04	2013.3	修士	日本	農学府	農業環境工学
33	Antonio Manuel Dos Santos Juniro	2011.04	2013.3	修士	モザンビーク共和国	農学府	国際環境農学
34	青井一洋	2011.04	2013.3	修士	日本	農学府	国際環境農学
35	花田修明	2011.04	2013.3	修士	日本	工学府	生命工学
36	青木和也	2011.04	2013.3	修士	日本	工学府	応用化学
37	上村美羽	2011.04	2013.3	修士	日本	工学府	応用化学
38	樋口亮	2011.04	2013.3	修士	日本	工学府	応用化学

39	宮崎雄矢	2011.04	2013.3	修士	日本	工学府	応用化学
40	Mohammad Sahin Polan	2011.10		博士	バングラデシュ	連合農学研究科（農工大）	生物生産科学
41	Raj Kumar Banjara	2011.10		博士	ネパール	連合農学研究科（茨大）	農林共生社会科学
42	玄　大雄	2011.10		博士	韓国	生物システム応用科学府	生物システム応用科学
43	Co Thi Kinh	2011.10	2013.9	修士	ベトナム	農学府	国際環境農学
44	Vo Thi Minh Tam	2011.10	2013.9	修士	ベトナム	農学府	国際環境農学
45	Mu Dan Hou	2011.10	2013.9	修士	中国	農学府	国際環境農学
46	Piyanuch Jaikaew	2011.10	2013.9	修士	タイ	農学府	国際環境農学
47	Jollibekov Vladimir	2011.10	2013.9	修士	ウズベキスタン	農学府	国際環境農学
48	Wang Jigemude	2011.10	2013.9	修士	中国・内モンゴル	農学府	国際環境農学
49	Thiam Magatt	2012.04		博士	モーリタニア	連合農学研究科	農業環境工学
50	森山 浩光	2012.04		博士	日本	連合農学研究科	農林共生社会科学
51	大倉　芙美	2012.04	2014.3	修士	日本	農学府	国際環境農学
52	陶野　理美	2012.04	2014.3	修士	日本	農学府	国際環境農学
53	塚野　桂	2012.04	2014.3	修士	日本	農学府	国際環境農学
54	阿部　ちひろ	2012.04		修士	日本	工学府	応用化学
55	武藤　元貴	2012.04		修士	日本	工学府	応用化学
56	山田　啓介	2012.04	2014.3	修士	日本	工学府	応用化学
57	山本　理博	2012.04	2014.3	修士	日本	工学府	応用化学
58	嶋田　省吾	2012.04	2014.3	修士	日本	工学府	応用化学
59	Poya Ghulam Hussain	2012.04	2014.3	修士	アフガニスタン	農学府	自然環境保全学
60	Ying Chun	2012.04	2014.3	修士	中国・内モンゴル	農学府	国際環境農学
61	Piniti Somjunyakul	2012.10		博士	タイ	連合農学研究科	農業環境工学
62	Sviridova Nina Vladimirovna	2012.10		博士	ロシア	連合農学研究科	農業環境工学
63	Mishyna Maryia	2012.10		博士	ベラルーシ	連合農学研究科	生物生産科学
64	松下 朋永	2012.10		博士	日本	工学府	電子情報工学
65	Rashied Tetteh	2012.10		博士	ガーナ	連合農学研究科	環境資源共生科学
66	Kamal Mohammed Zia Uddin	2012.10		博士	バングラデシュ	連合農学研究科	環境資源共生科学
67	Nguyen Dinh Giang Nam	2012.10		博士	ベトナム	（宇都宮大）連合農学研究科	農業環境工学
68	Lorn Vicheka	2012.10		修士	カンボジア	農学府	国際環境農学
69	Hiep Si Tang	2012.10		修士	ベトナム	農学府	国際環境農学
70	Omari Richard Ansong	2012.10		修士	ガーナ	農学府	国際環境農学
71	Hadian Permana	2012.10		修士	インドネシア	農学府	国際環境農学
72	Li Zhenhao	2012.04	2014.3	修士	中国	農学府	生物生産科学
73	Mardani korrani Hossein	2012.10		修士	イラン	農学府	生物生産科学
74	Rahman Md Hasnat	2012.10		修士	バングラデシュ	農学府	国際環境農学
75	武藤　啓	2012.04		修士	日本	農学府	環境農業工学
76	長谷川 瑞貴	2008.04	2014.3	獣医学部	日本	農学部	獣医学科

77	永田　絵美	2008.04	2014.3	獣医学部	日本	農学部	獣医学科
78	Song Kang ソウ コウ	2012.10		博士	中国	工学府	応用化学
短1	Kazantseva Elena	2012.10	2013.9	修士	ロシア	農学府	環境資源共生科学
79	細田　隼基	2013.04		修士	日本	農学府	物質循環環境科学
80	田畑　聡美	2013.04		修士	日本	農学府	国際環境農学
81	渡井　千絵	2013.04		修士	日本	農学府	物質循環環境科学
82	加賀　芳恵	2013.04		修士	日本	農学府	共生持続社会学
83	山村　理奈	2013.04		修士	日本	農学府	国際環境農学
84	八木岡　敦	2013.04		博士	日本	(茨城大) 連合農学研究科	農業環境工学
85	松浦　江里	2013.04		博士	日本	(茨城大) 連合農学研究科	農業環境工学
86	Harakhun Tanatavikorn	2013.04		博士	タイ	工学府	応用化学
87	竹村　龍一	2013.04		博士	日本	生物システム応用科学府	生物システム応用科学
88	Bao Qian 包　倩	2013.04		修士	中国	工学府	応用化学
89	志村　芙美	2013.04		修士	日本	工学府	応用化学
90	梅津　沙緒里	2013.04		修士	日本	工学府	電気電子工学
91	八百　多佳実	2013.04		修士	日本	工学府	応用化学
短2	小林　亮	2013.04		修士	日本	農学府	物質循環環境科学
短3	鈴木　徳馬	2013.04		修士	日本	農学府	物質循環環境科学
短4	小畑　雄司	2013.04		修士	日本	農学府	国際環境農学
短5	Hanhan Ahmad Sofiyuddin	2012.10		修士	インドネシア	農学府	国際環境農学
短6	Yi Swe Aye	2013.04		修士	ミャンマー	農学府	国際環境農学
短7	Sun Lijuan	2013.04		修士	中国	農学府	物質循環環境科学
短8	Nurdi Setyawan	2012.10		修士	インドネシア	農学府	国際環境農学
短9	Ma Hua 馬　驊	2012.04	2014.3	修士	中国	農学府	国際環境農学
短10	Yang Shuo 楊　朔	2012.04	2014.3	修士	中国	農学府	国際環境農学
短11	池上　史晃	2013.04		修士	日本	生物システム応用科学府	生物システム応用科学
短12	松川　公浩	2013.10		修士	日本	農学府	国際環境農学
短13	Omonov Aziz	2013.10		修士	ウズベキスタン	農学府	国際環境農学

	Name	Admission	Graduation	Course	Nationality	Faculy & Graduate School	Department
1	LI SEN	2009.04	2012.06	Doctor	China	Graduate School of Bio-Applications and System Engineering	Applied Chemistry
2	Zhao Long	2009.10	2012.09	Doctor	China	Graduate School of Engineering	Applied Chemistry
3	Rinawati	2009.10	2012.09	Doctor	Indonesia	United Graduate School of Agricultural Science	Symbiotic Science of Environment and Natural Resources
4	Pheng Sokline	2009.10	2011.09	Master	Cambodia	Faculty of Agriculture	International Environmental and Agricultural Science
5	Bessy Kho Sze Ee	2009.10	2011.09	Master	Malaysia	Faculty of Agriculture	International Environmental and Agricultural Science
6	Tungsomkid Jameekorrn	2009.10	2011.09	Master	Thailand	Faculty of Agriculture	International Environmental and Agricultural Science
7	Pham Anh Thi Quynh	2009.10	2011.09	Master	Vietnam	Faculty of Agriculture	International Environmental and Agricultural Science
8	Roueurn Siranet	2009.10	2011.09	Master	Cambodia	Faculty of Agriculture	International Environmental and Agricultural Science
9	Shohei Riya	2010.04	2013.03	Doctor	Japan	Graduate School of Engineering	Applied Chemistry
10	Shaofeng Gong	2010.04	2013.03	Doctor	China	Graduate School of Bio-Applications and System Engineering	Applied Chemistry
11	Kojiro Shimada	2010.04	2013.03	Doctor	Japan	United Graduate School of Agricultural Science	Symbiotic Science of Environment and Natural Resources
12	Mitsutoshi Fuke	2010.04		Doctor	Japan	United Graduate School of Agricultural Science	Biological Production Science
13	Ayumi Uehara	2010.04	2013.03	Doctor	Japan	United Graduate School of Agricultural Science	Biological Production Science
14	Kei Kondo	2010.04	2012.03	Master	Japan	Faculty of Agriculture	International Environmental and Agricultural Science
15	Tomoya Watanabe	2010.04		Master	Japan	Faculty of Agriculture	International Environmental and Agricultural Science
16	Tomoko Makita	2010.04	2012.03	Master	Japan	Graduate School of Agriculture	Environmental Science on Biosphere
17	Ei Ei Theint	2010.04	2012.03	Master	Myanmar	Faculty of Agriculture	International Environmental and Agricultural Science
18	Timilsina Govinda Narayan	2010.04	2012.03	Master	Nepal	Faculty of Agriculture	International Environmental and Agricultural Science
19	Chihiro Yamaguchi	2010.04	2012.03	Master	Japan	Faculty of Agriculture	International Environmental and Agricultural Science
20	Chutteang Cattleya	2010.10	2013.09	Doctor	Thailand	United Graduate School of Agricultural Science	Symbiotic Science of Environment and Natural Resources
21	Bui Xuan Dung	2010.10	2013.09	Doctor	Vietnam	United Graduate School of Agricultural Science	Symbiotic Science of Environment and Natural Resources
22	Mahmoud Rola S.O.	2010.10	2014.03	Doctor	Palestine	United Graduate School of Agricultural Science	Symbiotic Science of Environment and Natural Resources

						(Ibaraki University)	
23	Prathomrak Na-Ngern	2010.10	2012.09	Master	Thailand	Graduate School of Agriculture	Environmental Science on Biosphere／Department of International Environmental and Agricultural Science
24	Zhiqiu Xiao	2010.10	2012.09	Master	China	Graduate School of Agriculture	Science of Biological Production /Department of International Environmental and Agricultural Science
25	Soououn Nam	2010.10	2012.09	Master	South Korea	Graduate School of Agriculture	International Environmental and Agricultural Science
26	Win Win Pyone	2010.10	2012.09	Master	Myanmar	Graduate School of Agriculture	International Environmental and Agricultural Science
27	Aung Zaw Oo	2011.04	2014.03	Doctor	Myanmar	United Graduate School of Agricultural Science	Biological Production Science
28	Shuto Naotaka	2011.04		Master	Japan	Graduate School of Agriculture	Natural Resources and Eco-materials
29	Maki Itoh	2011.04	2013.03	Master	Japan	Graduate School of Agriculture	Environmental Science on Biosphere
30	Rina Kurumisawa	2011.04	2013.03	Master	Japan	Graduate School of Agriculture	Environmental Science on Biosphere
31	Yeo Bee Geok	2011.04	2013.03	Master	Malaysia	Graduate School of Agriculture	Environmental Science on Biosphere
32	Yuta Numajiri	2011.04	2013.03	Master	Japan	Graduate School of Agriculture	Environmental and Agricultural Engineering
33	Antonio Manuel dos Santos Junior	2011.04	2013.03	Master	Mozambique	Graduate School of Agriculture	International Environmental and Agricultural Science
34	Kazuhiro Aoi	2011.04	2013.03	Master	Japan	Graduate School of Agriculture	International Environmental and Agricultural Science
35	Nobuaki Hanata	2011.04	2013.03	Master	Japan	Graduate School of Engineering	Biotechnology and Life Science
36	Kazuya Aoki	2011.04	2013.03	Master	Japan	Graduate School of Engineering	Applied Chemistry
37	Miu Kamimura	2011.04	2013.03	Master	Japan	Graduate School of Engineering	Applied Chemistry
38	Ryo Higuchi	2011.04	2013.03	Master	Japan	Graduate School of Engineering	Applied Chemistry
39	Yuya Miyazaki	2011.04	2013.03	Master	Japan	Graduate School of Engineering	Applied Chemistry
40	Mohammad Sahin Polan	2011.10		Doctor	Bangladesh	United Graduate School of Agricultural Science	Biological Production Science
41	Raj Kumar Banjara	2011.10		Doctor	Nepal	United Graduate School of Agricultural Science (Ibaraki University)	Science on Agricultural Economy and Symbiotic Society
42	Masao Gen	2011.10		Doctor	Republic of Korea	Graduate School of Bio-Applications and System Engineering	Bio-Applications and Systems Engineering
43	Co Thi Kinh	2011.10	2013.09	Master	Vietnam	Graduate School of Agriculture	International Environmental and Agricultural Science

44	Vo Thi Minh Tam	2011.10	2013.09	Master	Vietnam	Graduate School of Agriculture	International Environmental and Agricultural Science
45	Mu Dan Hou	2011.10	2013.09	Master	China	Graduate School of Agriculture	International Environmental and Agricultural Science
46	Piyanuch Jaikaew	2011.10	2013.09	Master	Thailand	Faculty of Agriculture	International Environmental and Agricultural Science
47	Jollibekov Vladimir	2011.10	2013.09	Master	Uzbekistan	Faculty of Agriculture	International Environmental and Agricultural Science
48	Wang Jigemude	2011.10	2013.09	Master	China (Mongol)	Faculty of Agriculture	International Environmental and Agricultural Science
49	Thiam Magatt	2012.04		Doctor	Mauritania	United Graduate School of Agricultural Science	(UGA)Agricultural and Environmental Engineering
50	Hiromitsu Moriyama	2012.04		Doctor	Japan	United Graduate School of Agricultural Science	(UGA) Science on Agricultural Economy and Symbiotic Society
51	Fumi Okura	2012.04	2014.03	Master	Japan	Faculty of Agriculture	International Environmental and Agricultural Science
52	Rimi Tono	2012.04	2014.03	Master	Japan	Faculty of Agriculture	International Environmental and Agricultural Science
53	Katsura Tsukano	2012.04	2014.03	Master	Japan	Faculty of Agriculture	International Environmental and Agricultural Science
54	Chihiro Abe	2012.04		Master	Japan	Graduate School of Engineering	Applied Chemistry
55	Genki Muto	2012.04		Master	Japan	Graduate School of Engineering	Applied Chemistry
56	Keisuke Yamada	2012.04	2014.03	Master	Japan	Graduate School of Engineering	Applied Chemistry
57	Masahiro Yamamoto	2012.04	2014.03	Master	Japan	Graduate School of Engineering	Applied Chemistry
58	Shogo Shimada	2012.04	2014.03	Master	Japan	Graduate School of Engineering	Applied Chemistry
59	Poya Ghulam Hussain	2012.04	2014.03	Master	Afghanistan	Faculty of Agriculture	Environment Conservation
60	Ying Chun	2012.04	2014.03	Master	China (Mongol)	Faculty of Agriculture	International Environmental and Agricultural Science
61	Piniti Somjunyakul	2012.10		Doctor	Thailand	United Graduate School of Agricultural Science	(UGA)Agricultural and Environmental Engineering
62	Sviridova Nina Vladimirovna	2012.10		Doctor	Russia	United Graduate School of Agricultural Science	(UGA)Agricultural and Environmental Engineering
63	Mishyna Maryia	2012.10		Doctor	Belarus	United Graduate School of Agricultural Science	Biological Production Science
64	Tomohisa Matsushita	2012.10		Doctor	Japan	Graduate School of Engineering	Computer and Information Sciences
65	Rashied Tetteh	2012.10		Doctor	Ghana	United Graduate School of Agricultural Science	Symbiotic Science of Environment and Natural Resources
66	Kamal Mohammed Zia Uddin	2012.10		Doctor	Bangladesh	United Graduate School of Agricultural Science	Symbiotic Science of Environment and Natural Resources
67	Nguyen Dinh Giang Nam	2012.10		Doctor	Vietnam	United Graduate School of Agricultural Science (Utsunomiya University)	(UGA)Department of Environmental Engineering, Faculty of Agriculture, Utsunomiya University

68	Lorn Vicheka	2012.10		Master	Cambodia	Faculty of Agriculture	International Environmental and Agricultural Science
69	Hiep Si TANG	2012.10		Master	Vietnam	Faculty of Agriculture	International Environmental and Agricultural Science
70	Omari Richard Ansong	2012.10		Master	Ghana	Faculty of Agriculture	International Environmental and Agricultural Science
71	Hadian Permana	2012.10		Master	Indonesia	Faculty of Agriculture	International Environmental and Agricultural Science
72	Li Zhenhao	2012.04	2014.03	Master	China	Faculty of Agriculture	Biological Production Science
73	Mardani korrani Hossein	2012.10		Master	Iran	Faculty of Agriculture	Biological Production Science
74	Rahman Md Hasnat	2012.10		Master	Bangladesh	Faculty of Agriculture	International Environmental and Agricultural Science
75	Hiromu Muto	2012.04		Master	Japan	Faculty of Agriculture	Environmental and Agricultural Engineering
76	Mizuki Hasegawa	2008.04	2014.03	6th grade	Japan	Faculty of Agriculture	Cooperative Department of Veterinary Medicine
77	Emi Nagata	2008.04	2014.03	7th grade	Japan	Faculty of Agriculture	Cooperative Department of Veterinary Medicine
78	Song Kang	2012.10		Doctor	China	Graduate School of Engineering	Applied Chemistry
Short 1	Kazantseva Elena	2012.10	2013.09	Master	Russia	Faculty of Agriculture	Symbiotic Science of Environment and Natural Resources
79	Junki Hosoda	2013.04		Master	Japan	Faculty of Agriculture	Environmental Science on Biosphere
80	Satomi Tabata	2013.04		Master	Japan	Faculty of Agriculture	International Environmental and Agricultural Science
81	Chie Watai	2013.04		Master	Japan	Faculty of Agriculture	Environmental Science on Biosphere
82	Yoshie Kaga	2013.04		Master	Japan	Faculty of Agriculture	Studies in Sustainable and Symbiotic Society
83	Rina Yamamura	2013.04		Master	Japan	Faculty of Agriculture	International Environmental and Agricultural Science
84	Atsushi Yagioka	2013.04		Doctor	Japan	United Graduate School of Agricultural Science (Ibaraki University)	(UGA) Agricultural and Environmental Engineering
85	Eri Matsuura	2013.04		Doctor	Japan	United Graduate School of Agricultural Science (Ibaraki University)	(UGA) Agricultural and Environmental Engineering
86	Harakhun Tanatavikorn	2013.04		Doctor	Thailand	Graduate School of Engineering	Applied Chemistry
87	Ryuichi Takemura	2013.04		Doctor	Japan	Graduate School of Engineering	Bio-Applications and Systems Engineering
88	Bao Qian	2013.04		Master	China	Graduate School of Engineering	Applied Chemistry
89	Fumi Shimura	2013.04		Master	Japan	Graduate School of Engineering	Applied Chemistry
90	Saori Umetsu	2013.04		Master	Japan	Graduate School of Engineering	Electrical and Electronic Engineering
91	Takami Yao	2013.04		Master	Japan	Graduate School of Engineering	Applied Chemistry

short 2	Ryou Kobayashi	2013.04		Master	Japan	Faculty of Agriculture	Environmental Science on Biosphere
short 3	Tokuma Suzuki	2013.04		Master	Japan	Faculty of Agriculture	Environmental Science on Biosphere
short 4	Yuji Kobata	2013.04		Master	Japan	Faculty of Agriculture	International Environmental and Agricultural Science
short 5	Hanhan Ahmad Sofiyuddin	2012.10		Master	Indonesia	Faculty of Agriculture	International Environmental and Agricultural Science
short 6	Yi Swe Aye	2013.04		Master	Myanmar	Faculty of Agriculture	International Environmental and Agricultural Science
short 7	Sun Lijuan	2013.04		Master	China	Faculty of Agriculture	Environmental Science on Biosphere
short 8	Nurdi Setyawan	2012.10		Master	Indonesia	Faculty of Agriculture	International Environmental and Agricultural Science
short 9	Ma Hua	2012.04	2014.03	Master	China	Faculty of Agriculture	International Environmental and Agricultural Science
short 10	Yang Shuo	2012.04	2014.03	Master	China	Faculty of Agriculture	International Environmental and Agricultural Science
short 11	Fumiaki Ikegami	2013.04		Master	Japan	BASE	Bio-Applications and Systems Engineering
short 12	Kimihiro Matsukawa	2013.10		Master	Japan	Faculty of Agriculture	International Environmental and Agricultural Science
short 13	OMONOV Aziz	2013.10		Master	Uzbekistan	Faculty of Agriculture	International Environmental and Agricultural Science

FOLENS プログラム関係論文・発表リスト/ List of articles and presentations in relation to FOLENS

※姓のアルファベット順・太字は関係者名 / in alphabetical order of the first author's sir name & the names of FOLENS faculty and students in bold letters

＜教員による論文・発表 / Articles and presentations by faculty＞

【FOLENS プログラムに関する論文 / Articles on the FOLENS program】

二ノ宮リムさち,「大学の環境人材育成における『現場のための教育』の可能性と課題―持続可能な社会づくりへ向けた大学院教育を実現する『現場体験』とは」『共生社会システム研究』第 7 巻，137-157, 2013.

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