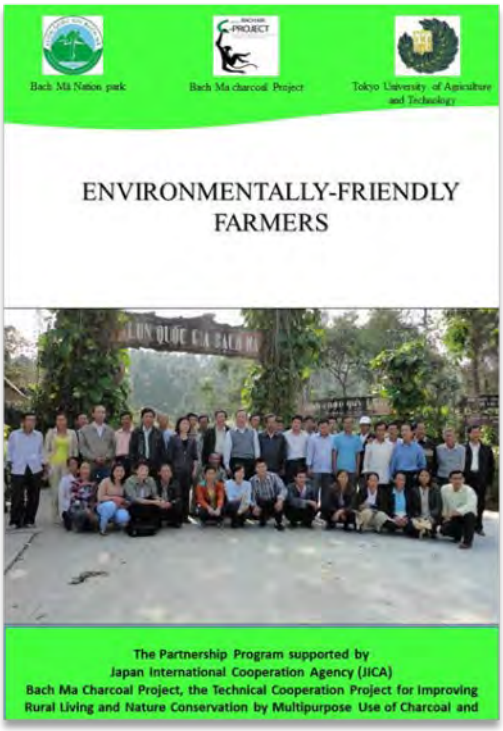
❑ モデル農家データブック



第１回から第６回の CEFL モデル研修会を受講した全 155 農家のうち、特に積極的かつ効果的にモデル実践を試みている農家 36 戸を対象に上級研修を行い、そのうえで「CEFL モデル実践農家」と認定した。

この 36 実践農家のデータ（連絡先、各戸の菜園・養豚場情報、得意分野、主な生産物）を１冊のデータブックにまとめ、各実践農家、ＢＭ国立公園、フエ農林大学、フエ農業研究開発センター、地元人民政府、JICA ベトナム事務所等に配布し、当事者同士の情報交換や互助システムの構築、また、新たな参入者への情報提供に資することを目指した。

INTRODUCTION

Bach Ma Charcoal Project is the Technical Cooperation Project for Improving Rural Living and Nature Conservation by Multipurpose Use of Charcoal and Wood Vinegar in the Bach Ma National Park, Vietnam. Bach Ma Charcoal Project was implemented by Tokyo University of Agriculture and Forestry (TUAT) with the cooperation of Bach Ma National Park in the Partnership Program supported by Japan International Cooperation Agency (JICA)

The objective of the project: transfer the production technology of charcoal, wood vinegar, organic fertilizer Bokashi-Charcoal, etc. and its application in organic agriculture to contribute to improve the income of the people who are living in the buffer zone and thereby contribute in the nature conservation in the core zone of Bach Ma National Park. The project has trained hundreds of farmers in the buffer zone and supported the development of dozens of farmers to participate in the Charcoal-applied Environmentally–friendly Farming with Livestock model (CEFL model). Thereby the farmers will be able to continue to participate in the production and training, transfer and replication for other farmers who have the same concern.

This book is the full information documents of 36 typical households of the project with the aim of forming a regional pioneer network, linking households to participate in the production of organic farming,

committing to protect the environment and protect the health of consumers. Through which, the farmer can learn, share each other's experiences, as well as help for those who care about the health of themselves, their family and the community can make a purchase from this farmers and encourage the movement of growing organic vegetables in developing regions.

This book is also considered as the gift from the project to thank the farmers who stick with us during the past time. We hope that the typical farmers of the project will contribute to the development of organic agriculture and the introduction of this technique for the communities in the region.

Sincere thanks and wishes to all of you, always have a good health!

On behalf of Bach Ma Charcoal Project

Nguyễn Vũ Linh

CEFL モデル実践農家(36 戸)・インストラクター(12 戸)・モデルファームのリスト

◎インストラクター ⇓	モデルファーム		名前	住所	頁
◎	菜園	養豚	Cao Thanh	Khe Su, Lộc Trì, Phú Lộc	1
◎	菜園		Cao Xoan	Khe Su, Lộc Trì, Phú Lộc	2
◎	菜園		Trương Văn Nguyện	Khe Su, Lộc Trì, Phú Lộc	3
◎	菜園	養豚	Nguyễn Chữ	Khe Su, Lộc Trì, Phú Lộc	4
◎	菜園		Nguyễn An	Khe Su, Lộc Trì, Phú Lộc	5
◎	菜園		Nguyễn Kim Thanh	Khe Su, Lộc Trì, Phú Lộc	6
◎	菜園		Nguyễn Ben	Khe Su, Lộc Trì, Phú Lộc	7
◎	菜園		Lê Xuân Trường	Khe Su, Lộc Trì, Phú Lộc	8
◎		養豚	Nguyễn Thám	Khe Su, Lộc Trì, Phú Lộc	9
			Nguyễn Văn Lượng	Khe Su, Lộc Trì, Phú Lộc	10
			Võ Đình Quang	Khu vực 3, Thị trấn Phú Lộc	11
◎	菜園		Phan Văn Lôi	Khu vực 8, Thị trấn Phú Lộc	12
	菜園		Nguyễn Minh Hậu	Khu vực 8, Thị trấn Phú Lộc	13
			Hồ Thị Lệ	Khu vực 9, Thị trấn Phú Lộc	14
		養豚	Lê Thị Hồng Hoa	Khu vực 9, Thị trấn Phú Lộc	15
		養豚	Nguyễn Thị Minh Tuyết	Khu vực 9, Thị trấn Phú Lộc	16
		養豚	Bùi Thị Thanh My	Khu vực 9, Thị trấn Phú Lộc	17
◎	菜園		Lê Diệp	Khu vực 9, Thị trấn Phú Lộc	18

◎	菜園		Cái Tăng	Hòa Mậu, Lộc Trì, Phú Lộc	19
	菜園		Cái Đoàn	Hòa Mậu, Lộc Trì, Phú Lộc	20
	菜園		Cái Hổ	Hòa Mậu, Lộc Trì, Phú Lộc	21
		養豚	Lê Phú Luận	Hòa Mậu, Lộc Trì, Phú Lộc	22
	菜園		Lê Phú Dũng	Hòa Mậu, Lộc Trì, Phú Lộc	23
			Cái Thị Chanh	Hòa Mậu, Lộc Trì, Phú Lộc	24
		養豚	Trương Văn Thuận	Trung Phước, Lộc Trì, Phú Lộc	25
			Trần Trúc	Trung Phước, Lộc Trì, Phú Lộc	26
			Đặng Sơn	Trung Phước, Lộc Trì, Phú Lộc	27
		養豚	Nguyễn Đà	Thôn 1 Hương Lộc, Nam Đông	28
			Lại Quốc Khoa	Thôn 2 Hương Lộc, Nam Đông	29
			Lương Hùng	Thôn 2 Hương Lộc, Nam Đông	30
			Trần Đình Cho	Thôn 2 Hương Lộc, Nam Đông	31
			Trần Đình Thắng	Thôn 2 Hương Lộc, Nam Đông	32
			Nguyễn Thị Bồng	Thôn 2 Hương Lộc, Nam Đông	33
	菜園		Trần Nam	Thôn 3 Hương Lộc, Nam Đông	34
			Huỳnh Xuân Lợi	Thôn 3 Hương Lộc, Nam Đông	35
			Mai Thanh Tâm	Thôn 3 Hương Lộc, Nam Đông	36
12	16	9	合計戸数		36

Dự án Than Bạch Mã

FARMER'S NAME: CAO THANH AND PHAN THỊ MĂNG

ĐT: 0168.8620.240

Address: Khe Su hamlet, Lộc Trì commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã charcoal project from September, 2008
Vegetable garden size : 602.2 m^2
Skill: Growing Chinese cabbage, eggplant, sprouts and many other vegetables
Main products: Chinese cabbage, eggplant, sprout, lettuce

Growing tomatoes in bag

Chili pepper nursery

Growing rice by S.R.I. methods

Teaching how to grow sprouts

This is the Project's "Model Farm" in Mr. Thanh's garden

Processing natural pesticides from plants

Caring vegetable garden

Some organic products in the vegetable garden

Dự án Than Bạch Mã

FARMER'S NAME: CAO XOAN AND PHẠM THỊ MINH LIỄU

TEL:0165. 5087. 909

Address: Khe Su hamlet, Lộc Trì commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from July, 2008
Vegetable garden size : 616.5 m^2
Skill: Growing eggplant, chili pepper, Chinese cabbage
Main products: Chinese cabbage, cucumber, sprouts vegetable, chili pepper, eggplant, pepper, jackfruit

Caring garden

Burning rice husk

Bran compost for Bokashi fertilizer

Caring sprouts

The Project's "Model Farm in Mr. Xoan's garden

Pig husbandry

Some organic producets in the vegetable garden

Dự án Than Bạch Mã

FARMER'S NAME: TRƯƠNG VĂN NGUYỆN AND NGUYỄN THỊ HỆ

TEL: 0936. 186. 602

Address: Khe Su hamlet, Lộc Trì commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from July, 2008
Vegetable garden size : 827.5 m^2
Skill: Growing Chinese cabbage, cucumber, chili pepper
Main products: winged bean, cucumber, eggplant, chili pepper, Chinese cabbage

Teaching farmers how to make fertilizer

Teaching farmers how to make Bokashi fertilizer

Teaching farmers how to burn rice husk

Harvesting winged beans

The Project's "Model Farm" in Mr. Nguyện's garden

Caring garden

Some organic products in the vegetable garden

Dự án Than Bạch Mã

FARMER'S NAME: NGUYỄN CHỮ AND TRƯƠNG THỊ XÊ

TEL: 054. 3671. 290

Address: Khe Su hamlet, Lộc Trì commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from July, 2008
Vegetable garden size : 336 m^2
Skill: Growing eggplant, cucumber, and Pig husbandry
Main products: eggplant, cucumber, fig, cabbage, and pigs

Preparing soil for planting vegetables

Application of charcoal and wood vinegar in the diet of pigs

Teaching farmers how to use charcoal and wood vinegar for livestock

Harvesting cucumbers

The Project's "Model Farm" in Mr. Chữ 's garden

Growing cucumbers in bag

Some organic products in the vegetable garden

Dự án Than Bạch Mã

FARMER'S NAME: NGUYỄN AN AND LÊ THỊ HẢO

TEL: 0165. 6774. 448

Address: Khe Su hamlet, Lộc Tri commune,
Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from April, 2008
Vegetable garden size : 517 m^2
Skill: Growing eggplant, water morning glory
Main products : eggplant, water morning glory, French bean, cucumber

Growing cucumber in bag

Harvesting cucumbers

Making Bokashi fertilizer

Burning rice husk

The Project's "Model Farm" in Mr. An's garden

Caring garden

Some organic products in the vegetable garden

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: NGUYỄN KIM THANH AND LÊ THỊ THÊM

TEL: 0169.497.9257

Address: Khe Su hamlet, Lộc Tri commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from October, 2008
Vegetable garden size : 808m^2
Skill: Growing eggplant, okra, cucumber
Main products : eggplant, okra, amaranth, cabbage

Burning rice husk

Composting Bokashi fertilizer

Stirring Bokashi fertilizer

Okra garden

The Project's "Model Farm" in Mr. Thanh's garden

Caring garden

Some organic products in the vegetable garden

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: NGUYỄN BEN AND TRẦN THỊ MAI

TEL:0164.4746.274

Address: Khe Su hamlet, Lộc Tri commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from April, 2008
Vegetable garden size: 690 m^2
Skill: Growing eggplant, cucumber
Main products: cucumber, eggplant, water morning glory

Okra garden

Nursing eggplant

Making Bokashi fertilizer

Cucumber garden

The Project's "Model Farm" in Mr. Ben's garden

Eggplants

Some organic products in the vegetable garden

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME : LÊ XUÂN TRƯỜNG AND NGUYỄN THỊ KIM HOA

TEL: 0982.802.289

Address: Khe Su hamlet, Lộc Tri commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September, 2008
Vegetable garden size : 238 m^2
Skill: Growing eggplant, cucumber
Main products: Chinese cabbage, salad greens, French bean, cucumber

Harvesting cucumbers

Bran compost for Bokashi fertilizer

Caring cucumbers

Teaching farmers how to make Bokashi fertilizer

The Project's "Model Farm" in Mr. Trường's garden

Intercropping of French beans and Chinese cabbages

Some organic products in the vegetable garden

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: NGUYỄN THÂM AND LÊ THỊ XUÂN

Address: Khe Su hamlet, Lộc Trì commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September, 2008
Vegetable planting area: 300 m^2
Skill: Pig husbandry

Mr. Thâm is one of the farmers involved in the project since the first day, he became the key farmer with the ability to teach the operation of CEFL model to other farmers.

TEL: 098.7484532

Caring garden

Make bokashi fertilizer

Teaching the farmers how to apply charcoal and wood vinegar in the pigs's feed

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: NGUYỄN VĂN LƯỢNG

TEL: 0120.6041.294

Address: Khe Su hamlet, Lộc Trì commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Carcoal Project from September, 2012
Vegetable garden size: 274.5m^2
Skill: Growing pepper, bamboo shoot
Main products: bamboo shoot, pepper, bitter gourd, banana, and pig.

Saffron garden

Caring pepper garden

Burning rice husk

Caring bitter gourd

The Project's "Model Farm" in Mr. Lượng's garden

Bamboo garden

Some organic products in the farm

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: VÕ ĐÌNH QUANG

TEL:097.8302756

Address: Area 3, Phú Lộc town, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from June 26, 2012
Skill: Pig husbandry
Pig husbandry: 2 times/ 1 year , average: 7 pigs/ 1 times
All pigs have been fed charcoal and wood vinegar mixed feed: 14 pigs

Mr. Quang caring his pigs

Harvesting cucumbers

Mr. Quang working in his garden

Garden products are mainly for home consumption.

Mr. Quang's wife sells some organic products at local Cầu Hai market.

Average income at the market:100.000đồng/1time

Products sold at the Cầu Hai market

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: PHAN VĂN LỐI AND NGUYỄN THỊ HỒ

TEL: 01215780049

Address: Area 3, Phú Lộc town, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September 27, 2012
Vegetable garden size:1,500 m^2
Skill: Growing bitter gourd, cucumber, okra, pumpkin.
Main products: bitter gourd, cucumber, okra, pumpkin, Chinese cabbage, chili pepper, ginger, papaya, banana, spinach

Mr. Lối and Mrs. Hồ caring bitter guords and okras

Ms. Hồ harvesting pumpkin

Mr. Lối applied techniques of organic vegetables offered by the project staff for his vegetable gardenfor home consumption. In addition, he is selling at the Xép market in Phu Loc Town, gaining average 100.000 đồng / day

Mr. Lối's farm was chosen to build the Project's first "Mushroom Model Farm"

Straw mushroooom – first harvest

Information key farmers of Bạch Mã Charcoal

Dự án Than Bạch Mã

FARMER'S NAME: NGUYỄN MINH HẬU

TEL: 0935451565

Address: Area 8, Phú Lộc town, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from June 26, 2012
Vegetable garden size: 150m^2
Skill: Growing okra and basil
Main products: Chinese cabbage, salad greens, okra, basil, Vietnamese loofah.

Caring garden

Burning rice husk

Bran compost for Bokashi fertilizer

Chili pepper garden

The Project's "Model Farm" in Mr. Hậu's garden

Vietnamese loofah garden

Some organic products in the vegetable garden

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: HỒ THỊ LỆ

TEL: 0164.8372184

Address: Area 8, Phú Lộc town, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from June 26, 2012
Skill: Pig husbandry
Pig husbandry: 2 times/ 1 year , average: 7 pigs/ 1 times
All pigs have been fed charcoal and wood vinegar mixed feed since the training: 9 pigs

The Project's "Model Pig Farm" at Mr. Lệ 's farm

Some pictures of Mrs Lệ 's pigs

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: LÊ THỊ HỒNG HOA

TEL:054.6289229

Address: Area 9, Phú Lộc town, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September 7, 2012
Vegetable garden siza: 100 m^2
Skill: Pig husbandry
Pig husbandry: 3 times/ 1 year , average: 12 pigs/ 1 times
All pigs are fed charcoal and wood vinegar mixed feed: 7 pigs

Piglets

Pigs raised for meat

Sow

The Project's "Model Pig Farm" at Mrs. Hoa's farm

Caring sows

Some organic products in the vegetable garden

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: NGUYỄN THỊ MINH TUYẾT

TEL: 01655737248

Address: Area 8, Phú Lộc town, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September 7, 2012
Skill: Pig husbandry
Pig husbandry: 2 times/ 1 year , average: 2-4 pigs/ 1 times
From the date of the training to now. All pigs are fed charcoal and wood vinegar mixed feed: 4 pigs
She also makes rice husk charcoal and wood vinegar for pigs.

Burning rice husk to make charcoal and wood vinegar

Ms. Tuyết caring her pigs

Pigs are fed charcoal and wood vinegar mixed fodder.

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: BÙI THỊ THANH MY

Address: Area 9, Phú Lộc town, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from March 20, 2012
Skill: Pig husbandry.
2 times/ 1 year , average: 4-8 pigs/ 1 times
From the date of the training to now, all pigs have been fed charcoal and wood vinegar mixed feed: 15 pigs

TEL: 0168.9219441

Ms. My caring her pigs

Banana trunks are fed to pigs.

Pigs are fed a mixture of charcoal and wood vinegar with their feed.

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: LÊ DIỆP

Adress: Area 9, Phú Lộc town, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from February 10, 2012
Vegetable garden size: 970 m^2
Skill: Growing bitter gourd, chili pepper, bamboo shoots
Main products: bitter gourd, chili pepper, bamboo shoots, cabbage, French bean…

Mr. Diệp making Bokashi fertilizer to use for his garden

Mr. Diệp'garden

The Project's "Model Farm" in Mr. Diệp's garden

Ms. Diệp harvesting

Mr. Diệp caring his garden

Information key farmers of Bạch Mã Charcoal

Dự án Than Bạch Mã

FARMER'S NAME: CÀI TĂNG

Address: Lộc Trì hamlet, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from May 21 2012
Vegetable garden size: 500 m^2
Skill: Growing Basella alba, okra, pumpkin, and making Bokashi
Main products: Basella alba, okra, French bean, pumpkin, basil, amaranth and etc.

TEL: 01655445960

Mr Tăng harvesting folium sauropis and French beans

Mr. Tăng caring his garden

Teaching the farmers how to burn rice husk at the Training Workshop

Mr. Tang has successfully applied the CEFL-model techniques of the project and become one of the key farmers who can teach the technics of the Model to other farmers.

Since participating in the Project, Mr. Tăng has made 3 cubic meters of Bokashi for using in his vegetable garden. He also sells vegetables at local Cau Hai market, the average gain of 60.000 VND / day.

Information key farmers of Bạch Mã Charcoal

Dự án Than Bạch Mã

FARMER'S NAME: CÀI ĐOÀN

Address: Hòa Mậu hamlet, Lộc Trì commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from May 21, 2012
Vegetable garden size : 1,000 m^2
Skill: Growing suger cane, banana, ginger, Chinese cabbage, etc

TEL: 0167.5123474

Some of Mr. Đoàn's activities after participating in the project

After participating in the project, Mr. Đoàn made 10 cubic meters of Bokashi for his vegetable garden. Vegetables are for home consumption. He also sells vegetables at Cau Hai market, contributing to his family income.

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: CÀI HỒ

Address: Hòa Mậu hamlet, Lộc Trì commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from May 21, 2012
Vegetable garden size: 300 m^2
Skill: Growing yam, winged yam
Main products: edible yam, winged yam, bitter gourd, cucumber, okra, French bean, Chinese cabbage, etc.

TEL: 0121.3518350

Mr. Hồ caring his garden

Since participating in the project, Mr. Hồ has applied the Model in his vegetable garden. Products are mainly for his home consuption, but he also sells vegetables in the local market, contributing to his family income.

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: LÊ PHÚ LUẬN

Address: Hòa Mậu hamlet, Lộc Trì commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September 7, 2012
Vegetable garden size: 500 m^2
Skill: Pig husbandry

ĐT: 0120.2629674

Mr. Luận has been raising pigs for 10 years. After involved in the Project, he mixed charcoal and wood vinegar inot the pigs' feed. Pigs became very healthy and he retains good porkers.

Mr. Luận burning rice husk for charcoal and wood vinegar

Mr. Luận planting sprouts

Mr. Luân continues mixing charcoal and wood vinegar for newborn pigs.

Ms. Luận caring his pigs

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: LÊ PHÚ DŨNG

Address: Hòa Mậu hamlet, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from February, 2012
Vegetable garden size: 175m^2
Skill: Planting bitter gourd, cabbage, okra
Main products: cabbage, salad greens, okra, bitter gourd, Basella alba (Malabar spinach)

TEL: 0976.206.690

Bran compost for Bokashi fertilizer

Making Bokashi

Burning rice husk

Caring garden

The Project's "Model Farm" in Mr. Dũng's garden

Cucurbit garden

Some organic products in the vegetable garden

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: CÁI THỊ CHANH

Address: Lộc Trì commune, Phú Lộc district, T.T. Huế province
Involved in Bạch Mã charcoal project from September 27, 2012
Skill: Pig husbandry
Pig husbandry: 2 times/ 1 year , average: 4 pigs/ 1 times
All pigs have been fed charcoal and wood vinegar in their feed: 2 pigs

TEL: 098.3949185

Ms. Chanh's pig farm is the Project's "Model Farm"

Ms. Chanh taking care of her pigs

Pigs raised for meat

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: TRƯƠNG VĂN THUẬN

Address: Trung Phước hamlet, Lộc Tri commune, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from Jun 21, 2012
Skill: Pig husbandry
Pig husbandry: 3 times/ 1 year , average: 7 pigs/ 1 times
All pigs have been fed charcoal and wood vinegar in their feed: 11 pigs

TEL: 098.6624101

Making rice husk charcoal

45-day-old piglets

15-day-old piglets

Mr. Thuận's pig farm is the Project's "Model Farm"

30-day-old piglets

Pigs raised for meat

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: TRẦN TRÚC

Address: Trung Phước hamlet, Lộc Tri commune, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from January 11, 2012
Vegetable garden size: 400 m^2
Skill: growing bitter melon, cucumber
Main products: bitter gourd, cucumber, French bean, etc.

TEL:054.3892231

Cucumber garden of Mr. Trúc

The Project's "Model Farm" in Mr. Trúc's garden.

French bean

Some bitter gourds in the garden

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME : ĐẶNG SƠN

Address: Trung Phước hamlet, Lộc Tri commune, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from Jun 21, 2012
Skill: Pig husbandry
Pig husbandry: 2 times/ 1 year , average: 2-6 pigs/ 1 times
From the date of the training to now, all pigs have been fed charcoal and wood vinegar in their feed: 4 pigs

TEL: 0166.2599.290

Mr. Sơn taking care of his pigs

A sow and piglets

Mr Sơn's son helping with the care of the pigs.

Pigs are fed charcoal and wood vinegar

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: NGUYỄN ĐÀ

Address: Hương Lộc commune, Nam Đông distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September 28, 2012
Skill: Pig husbandry

After participating in the training, Mr. Đà applied charcoal and wood vinegar to his pigs. Now, his 9 pigs' condition became very good, and have no diarrhea. In addition, he has been using the skills learnt from the Training Workshop: howto plant vegetables and sprouts for his home consumption.

Ms Đà care pigs

Information key farmers of Bạch Mã Charcoal

Dự án Than Bạch Mã

FARMER'S NMAE: LẠI QUỐC KHOA

Address: Hương Lộc commune, Nam Đông distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September 27, 2012
Vegetable garden size: 600 m^2
Skill: Planting banana
Main products: banana, bitter gourd, pumpkin

TEL:01202559971

Bokashi-than fertilizer

Banana garden

Banana

Pumpkin

The Project's "Model Farm" in Mr. Hoa's garden

Sweet potato

Vietnamese loofah

Pumpkin

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: VÕ ĐÌNH QUANG

Address: Area 3, Phú Lộc town, Phú Lộc distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from June 26, 2012
Skill: Pig husbandry
Pig husbandry: 2 times/ 1 year , average: 7 pigs/ 1 times
All pigs have been fed charcoal and wood vinegar mixed feed: 14 pigs

TEL:097.8302756

Mr. Quang caring his pigs

Harvesting cucumbers

Mr. Quang working in his garden

Garden products are mainly for home consumption.

Mr. Quang's wife sells some organic products at local Cầu Hai market.

Average income at the market:100.000đồng/1time

Products sold at the Cầu Hai market

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: TRẦN ĐÌNH CHO

Address: Hương Lộc commune, Nam Đông distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September 27, 2012
Skill: Pig husbandry
Pig husbandry: 2 times/ 1 year , average: 2-4 pigs/ 1 times
From the date of the training to now, all pigs have been fed charcoal and wood vinegar: 2 pigs

Some pictures of Mr. Cho' pigs

Pigs raised for meat

Mr. Cho's sow

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: TRẦN ĐÌNH THẮNG

Address: Hương Lộc commune, Nam Đông distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September 27, 2012
Vegetable garden size: 780 m^2
Skill: Growing sugar cane, banana, corn
Main products: sugar cane, banana, corn, sweet potato, ginger, tobacco, etc.

Sweet potato garden

Banana garden

Ginger garden

Tobacco garden of Mr.Thắng

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: NGUYỄN THỊ BỒNG

Address: Hương Lộc commune, Nam Đông district, T.T. Huế province
Skill: planting vegetables, flowers (specially daisy), fruit-trees
Vegetable garden size: 700 m^2
Involved in Bạch Mã Charcoal Project from September 27, 2012

Chinese cabbage garden

Daisy and cabbage garden

Ms. Bồng harvesting French beans

Chinese cabbage in Ms. Bồng's garden

Ms. Bồng and her daisy garden

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: TRẦN NAM

Address:Hương Lộc commune, Nam Đông district, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September 28, 2012
Vegetable planting area: 500 m^2
Skill: Growing bitter gourd, pumpkin
Main products: bitter gourd, zucchini, pumpkin, salad greens, Chinese cabbage, sugar cane, banana, and pigs

TEL.: 0167.9770893

Some products in Mr. Nam's garden

Making Bokashi

Burning rice husk

The Project's "Model Farm" was built in Mr. Nam's garden in Nam Đông. He makes compost to make Bokashi for vegetable garden for his home consumption.

Mr. Nam caring his pigs

Pigs raised for meat

Information key farmers of Bạch Mã Charcoal

FARMER'S NAME: HUỲNH XUÂN LỢI

Address: Hương Lộc commune, Nam Đông distric, T.T. Huế province
Vegetable garden size: 1000 m^2
Involved in Bạch Mã Charcoal Project from September 27, 2012
Skill: planting vegetables, baby jackfruit (gac) , corn, fruit-trees

Fertilizer to make Bokashi

Pumpkin

Baby jackfruit (Gac)

Vegetable sprouts

Banana garden

Corns grown enough for harvesting

Information key farmers of Bạch Mã Charcoal project

Dự án Than Bạch Mã

FARMER'S NAME: MAI THANH TÂM

Address: Hương Lộc commune, Nam Đông distric, T.T. Huế province
Involved in Bạch Mã Charcoal Project from September 27, 2012
Skill: Pig husbandry.
2 times/ 1 year , average: 3-5 pigs/ 1 times
From the date of the training to now, all pigs have been fed a mixture of charcoal and wood vinegar in their feed: 3 pigs

Pigs are fed a mixture of charcoal and wood vinegar in their diet.

Sows and piglets are fed charcoal and wood vinegar in their fodder.

Information key farmers of Bạch Mã Charcoal project

❑ CEFL モデル研修会プログラムの雛型

1 日プログラム - A : CEFL モデル未経験者対象の場合

順	時間	プログラム内容	担当	場所
1	10 分	研修プログラム概要説明	プロジェクトスタッフ	公園集会所 or 農家敷地
2	20	バックマーチャコールプロジェクトの紹介 （公園事業とプロジェクトの関わりについて等）	公園幹部職員 or プロジェクトスタッフ	
3	60	**CEFL モデル研修：実演・実習【①～⑤】** ①　もみ殻くん炭の作り方　②　木酢液の抽出法	インストラクター農家 プロジェクトスタッフ	農家敷地
4	30	小休憩/参加者交流	参加者全員	
5	60	③　ボカシ炭の作り方：実演・実習	農家インストラクター プロジェクトスタッフ	
6	60	昼食/ 休憩/参加者交流	参加者全員	公園の食堂
*7	(60)	★　招聘講師による講義：【例】土壌改良について	招聘講師【農工大他】	公園集会所
8	45	④　モデルファーム【養豚舎】の見学 ＊　飼料に炭を混ぜる実演・実習（下痢抑制） ＊　飼料に木酢液を混ぜる実演・実習（食欲増進） ＊　炭による豚舎の臭い・ハエの削減（衛生管理）	インストラクター農家 and/or モデル実践農家	モデル実践 農家養豚舎
	(45)	⑤「*7」がない時：モデルファーム【菜園】見学 ＊　モデル実践農家による実績紹介、意見交換等		農家の菜園
9	45	⑥（炭を用いた）スプラウト栽培の実演・実習	インストラクター農家	農家敷地
10	45	⑦　質疑応答　⑧クイズ形式の「研修おさらい会」	参加者全員	
11	15	総括・閉会の挨拶	公園幹部職員/招聘専門家/プロジェクト代表	
12	30	振り返りミーティング：プロジェクトスタッフとインストラクター農家		農家宅

1日プログラム - B：CEFL モデル実践者対象の場合

順	時間	プログラム内容	担　当	場　所
1	10分	研修プログラムの概要説明	プロジェクトスタッフ	役場 or 公園の集会所
2	20	公園 or 地区役場幹部による挨拶と当該地区の紹介	公園 or 地区役場幹部	
3	20	バックマーチャコールプロジェクトの紹介 【公園・地区開発事業とプロジェクトの関わり等】	公園幹部職員 or プロジェクトスタッフ	
4	120	＊モデルファーム【菜園・養豚舎】2～3 か所の見学 モデル実践農家による活動・実績紹介、意見交換	モデル実践農家	モデル実践農家の 菜園・豚舎
5	60	昼食/休憩/参加者交流	参加者全員	近隣 or 公園の食堂
6		招聘講師による講義・実習 研修目的、招聘講師の専門分野により異なる内容	農工大、フエ農林大、カント一大学教員・専門家	役場 or 公園の集会所
	5	①　MC による講師と講義内容の紹介	プロジェクトスタッフ	集会所ではＰＰＴを用いた講義が可能。 天候・内容により、午前・午後のプログラム交換
	30	②　もみ殻燻炭を利用した豚の下痢予防、衛生管理	招聘講師Ａ	
	30	③　有機農法：害虫防除の基礎知識と方法	招聘講師Ｂ	
	30	④　小休憩：コーヒーブレイク＆参加者交流	参加者全員	
	30	⑤　ニームを用いた自然農薬の作り方：実演・実習	招聘講師Ｃ	
	45	⑥　質疑応答（各講義の後に行う場合も有り）	参加者全員	
7	10	総括・閉会の挨拶	招聘講師代表　and/or 現地プロジェクト代表	
8	30	ミーティング：招聘講師と農家代表・プロジェクトスタッフの意見交換会		プロジェクトオフィス

❑ CEFL モデル研修用教科書

本テキストブックは、「炭を用いた循環型有畜産複合農業モデル（CEFL モデル）」の分野別普及用/研修会用テキストを一冊にまとめたもので「CEFL モデル概要」、「炭・もみ殻燻炭作りと利用法」、「炭・木酢液を用いた養豚」、「ボカシ炭堆肥」、「有機野菜栽培法（7 野菜）」の 5 分野で構成されている。

内容は、東京農工大、フエ農林大学、フエ農業研究開発センターの各分野専門家たちによる共同実験・研究の成果を元に、あくまでも現場のニーズに則したものとした。

どんなに有効なモデルでも、中途半端な理解、独断、誤用などより効果が半減するばかりでなくトラブルの原因にもなりかねないことを想定し、本モデルが今後も正しく実践・普及されるよう、12 戸の「CEFL モデル技術インストラクター」を含む 36 戸の「CEFL モデル実践農家」に配布した。本テキストブックは英語版とベトナム語版がある。

INTRODUCTION

Continuous Improvement of the Techniques for Environmentally-friendly Farming

Environmentally-friendly farming is one of the major trends in the world agriculture. And the importance of this farming is especially accentuated around Bach Ma National Park. The ultimate aim of the "environmentally-friendly farming" and the "fundamental techniques to achieve it" is supposed to be common in the world.

One of such common techniques is "improvement of soil fertility by using compost." Although it is true, details of the applied realistic techniques widely vary from region to region. We should make techniques suitable to the respective region, considering climatic, edaphic and social conditions, including situation of sustainably available resources in the region.

You have been learning basic techniques suitable for your region. I hope you will accumulate further experiences in your farming practice, and continuously extract many living knowledge through them. "Careful and exact observation of crops, domestic animals and soil" must yield new findings possibly leading to advance of skill and knowledge.

This Textbook is a compilation of several textbooks used for the training workshops for Charcoal-applied Environmentally-friendly Farming with Livestock model (CEFL model). This model has been promoted by Bach Ma Charcoal Project aiming to improve health, rural living and nature conservation by multiple-use of charcoal and wood vinegar in the buffer zone of Bach Ma National Park, from July 2008 to March 2013.

We made this textbook for you to continue to practice and promote the CEFL model most properly and effectively in the future. No matter how excellent a textbook may be, your fragmentary knowledge, arbitrary decision, and misuse of the model may reduce its positive effects, or may cause troubles in the worst case. When you are in trouble or wonder what to do, please review this textbook. It is very important to have a solid grasp of the basic.

Finally let me emphasize that healthy and fertile soil is the foundation of the good food system. It produces healthy crops in plenty, which in turn well nourish the people and enrich people's life.

You will win your way!

Yasuhiro Arima
Professor Emeritus
Tokyo University of Agriculture and Technology

1

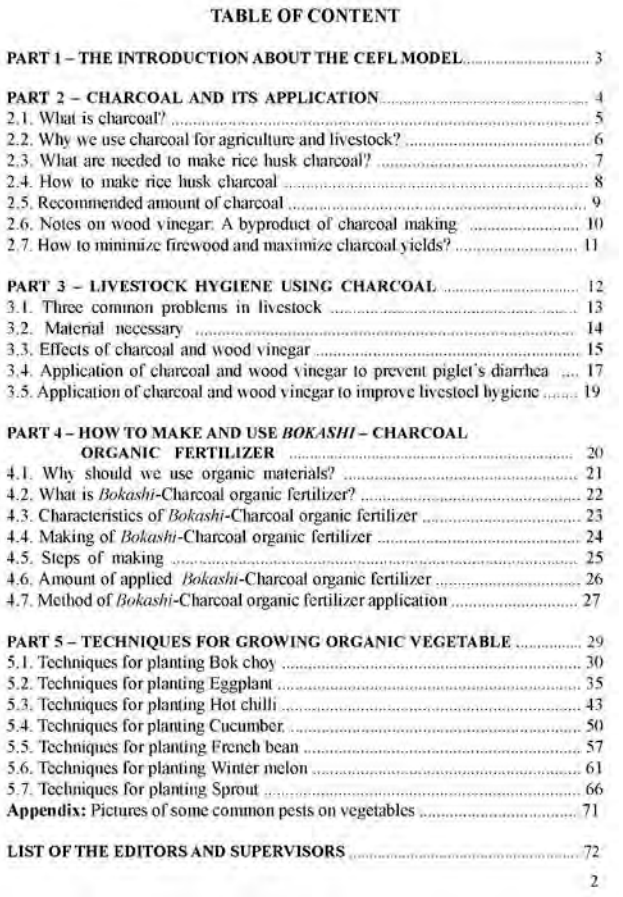


TABLE OF CONTENT

2

PART 1: THE INTTRODUCTION ABOUT THE CEFL MODEL

The CEFL model is "*Charcoal-applied Environmentally-friendly Farming with Livestock model*"

Illustrated by Atsuko Saito (unpublished)

This model has been implemented by more than 30 houldholds in Phu Loc and Nam Dong district, especially in **Khe Su village**, the **buffer zone of Bach Ma National Park (BMNP)**, with the guidance of **"Bach Ma Charcoal Project"** in **cooperation with BMNP** and **Tokyo University of Agriculture and Technology** under the **JICA Partnership Program** .

3

PART 2: CHARCOAL AND ITS APPLICATION

BACH-MA -PROJECT

Tokyo University of Agriculture and Technology | Japan International Cooperation Agency | Bach Ma National Park

JICA Partnership Program
Technical Cooperation Project for Improving Rural Living and Nature Conservation by Multipurpose Use of Charcoal and Wood Vinegar in the Bach Ma National Park

2.1. What is charcoal?

- ✓ Charcoal is black porous carbon made from biomass (as from wood by charring in a kiln from which oxygen is excluded)

Wood charcoal

Rice husk charcoal

- ✓ Charcoal provides various functions: Not only for non-smoke fuel, but also for regulating moisture indoors, absorbing smell, purifying muddy water, etc.

- ✓ Various applications in agricultural and environmental sectors.

Carbonization: How wood is transformed into charcoal

When the wood is dry and heated to around 280°C, carbonization begins to *spontaneously* break down to produce charcoal plus water vapor, methanol, acetic acid and more complex chemicals, chiefly: tars and gas.

Source: FAO (1983) "Simple technologies for charcoal making"

5

2.2. Why we use charcoal for agriculture and livestock?

To improve soil humidity and texture in farm lands

- The porosity of charcoal is thought to make soil permeable, provide living habitat for effective microorganisms, and reduce the leaching of nutrients and minerals.

To prevent piglet diarrhea & improve livestock hygiene

- Feeding with charcoal powder helps healthy growth of piglets, and reduce the use of antibiotics.
- Scattering charcoal in/around livestock eliminates the odor, improve the hygiene.

We are promoting ***"Charcoal-applied Environmentally-friendly Farming with Livestock" (CEFL) Model*** around Mt. Bach Ma

6

2.3. What are needed to make Rice Husk Charcoal?

1. Materials: Rice husk

Alternative sources: Agro-waste: Sawdust, branches pruned, bark, litter (fallen leaves, twigs), corn cob, peanut shell, coconut shell, etc.

Please do not use toxic plants

2. Equipments

Stainless chimney fixed with a pile

Pail & water

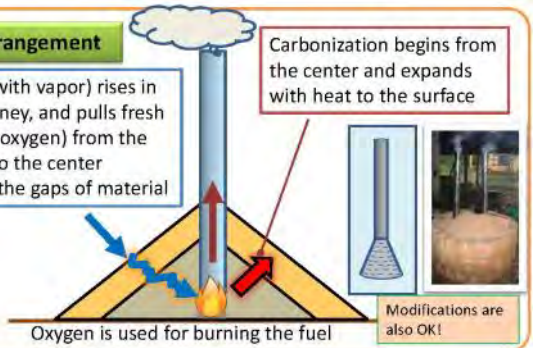
Watering pot

Firewood pieces

3. Arrangement

Hot air (with vapor) rises in the chimney, and pulls fresh air (with oxygen) from the surface to the center through the gaps of material

Carbonization begins from the center and expands with heat to the surface



Modifications are also OK!

2.4. How to Make Rice Husk Charcoal

Stand the chimney about 10 - 15cm apart from the ground

Burn fuel wood pieces under the chimney, then put the material around the fire; smoke will be coming out of the chimney

When the surface gets black, lightly turn it up

When the mound is totally carbonized, put water to stop charring.

Agro-waste charcoal can be used a few days after making

2.5. Recommended Amount of Charcoal

Cultivation (Vegetable & Paddy)

Recommended amount of charcoal (rice husk charcoal or crushed pieces of wood charcoal) for the first time*:

100g - 200g/m2 or 200 kg/sao (1sao = 1000 m2)

From the second time, we can reduce the amount since some charcoal still remains in the soil.

* ***Amount of charcoal can be put more if the soil is too hard.***

Livestock Hygiene

- Prevent piglets' diarrhea

→Mix charcoal powder into pig feed: 8 gram charcoal powder & 2 ml vinegar (made from wood or agro-waste) for each 1 kg of daily piglet's feed.

- Improve livestock hygiene (eliminate bad odor of manure)

→ Mix charcoal into feces heap (1bag (20kg) for 1m^3 of manure).

2.6. Notes on wood vinegar: A byproduct of charcoal making

What is wood vinegar?

(agro-waste vinegar)

Sour liquid collected from the smoke During charcoal making.

How to collect it?

We can receive the smoke liquid at the chimney and the extended chimney.

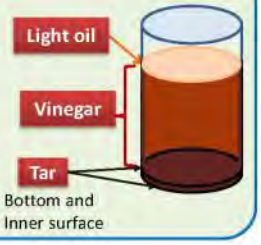
→For agro-waste charcoal making: during carbonization.

→For wood charcoal making in the kiln: while smoke temperatures range from 85 – 120^{0}C (to minimize toxic substances.)

How to use?

Vinegar should be stored for more 3 months after collecting, to separate it into 3 layers. The middle is vinegar.

Various organic acids are expected to support soil microorganisms and Improve soils.



More details are given from instructors.

2.7. How to Minimize Firewood and Maximize Charcoal Yields?

When smoke color turned pale and clear, close the kiln totally

Material in the drum

Wood vinegar using a bamboo/stainless pipe

Chimney: Stainless or earthen pipe

Drum kiln

The fire break prevents the fire from damaging the material

Earth kiln (or Brick kiln)

Burn fuel slowly to supply hot air with less oxygen, and to heat & dry the material

Small firewood as a trigger of carbonization

When chimney smoke temperature exceeds 80°C, minimize air supply

11

PART 3: LIVESTOCK HYGIENE USING CHARCOAL

Wood vinegar | **Wood charcoal of rice husk charcoal**

?

?

BACH-MA -PROJECT

Tokyo University of Agriculture and Technology

Japan International Cooperation Agency

Bach Ma National Park

JICA Partnership Program
Technical Cooperation Project for Improving Rural Living and Nature Conservation by Multipurpose Use of Charcoal and Wood Vinegar in the Bach Ma National Park

3.1. Three common problems in livestock

The use of antibiotics uncontrolled	Piglet has just weaned, pig often have diarrhea	Pigpen have bad smell because of feces and urine of pigs
-Increasing of antimicrobial resistant strains. -Affect human health when people use products containing drug resistant bacteria	-Takes more money for health services and buy drug treatment of diarrhea. - Will take longer to recover after piglet have diarrhea.	- Poor sanitation cause disease in both humans and domestic animals. - Bad smell affects the daily activities of neighbors.

New Solution

Simple

easy to do

use CHARCOAL and WOOD VINEGAR

Gain

- Prevent piglet's diarrhea
- Improve livestock hygiene
- Reduce the use of antibiotic
- Help pig grow well, early mature

13

3.2. Material necessary

CHARCOAL: products of burning many different materials (firewood, rice husk, bamboo, etc.)

Making wood charcoal

Wood charcoal - Finished product

Making rice husk charcoal

Rice husk charcoal - Finished product

WOOD VINEGAR: A liquid received when cooling down the smoke of making charcoal processing .

Wood vinegar is collected in the process of making charcoal

Wood vinegar – Finished product

14

3.3. Effects of charcoal and wood vinegar

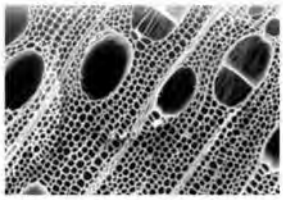
3.3.1. Structure characteristics and effects charcoal

Structure characteristics: Charcoal have many tiny holes on the surface when we look under a microscope.

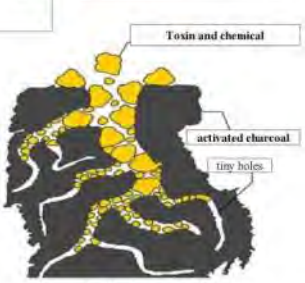
Effect: Charcoal is a good adsorbent

- A substrates where bacteria stick and adsorption of bacterial toxins
- Adsorption of toxic gases and chemicals.

➢Charcoal will adsorbent bacteria and bacterial toxins then it is excreted in the feces because charcoal is not digested and absorbed.



Many tiny holes on the activated charcoal surface



Charcoal will adsorbent toxin and chemical

3.3.2. The chemical composition and effects of wood vinegar

Contents of wood vinegar: Organic acid, Phenol, Carbonyl, Alchohol, Base, Other substance

Effects

- Disinfectant
- Reduction bad odor
- Protection from insect
- Improvement of soil quality

→ Limit the harmful effects of bacteria and parasites in the intestine of pigs.

Healthy pig!

High quality pork!

3.4. Application of charcoal and wood vinegar to prevent piglet's diarrhea

Charcoal and wood vinegar is mixed into the daily diet of piglet to prevent piglet's diarrhea.

3.4.1. How to use

Wood charcoal or rice husk charcoal (is crushed into small pieces) and wood vinegar is mixed into food according to the recommended dosage for piglets

Rice husk charcoal

Wood vinegar

No diarrhea
Fast growth
Reduce bad smell in the pigpen

3.4.2. The recommended dosage

Charcoal: 8g /1 kg of daily piglets' feed

Wood vinegar: 2ml /1 kg of daily piglets' feed

3.4.3. Points to note

! NOTE: DON'T USED CHARCOAL AND WOOD VINEGAR MORE THAN RECOMMENDED DOSAGE!

- Charoal: If you use overdose of charcoal, piglets will be constipated
- Wood vinegar: If you use overdose of wood vinegar, it will increase the level of corrosion gastrointestinal mucosa.

3.4.4. Some results of practical application in Huong Van commune

- Research periods: September- December 2010
- Research place: Huong Van commune in Thua Thien Hue province
- Research methods: Measure of occurrence of diarrhea after adding charcoal and wood vinegar

Occurrence of piglet diarrhea when adding charcoal and wood vinegar in feed (charcoal 0.8%+wood vinegar 0.2%)

Addition of charcoal and wood vinegar	No. of pig farm	Occurrence of piglet diarrhea
Feeding group	30	1.6%
Control group	12	17.4%

3.5. Application of charcoal and wood vinegar to improve livestocl hygiene

Rice husk charcoal is used to reduce bad odor in barn by mixing it with the waste of poultry.

Ways and dosage

Rice husk charcoal is mixed into the cesspit or spread on the floor of the barn to reduce bad odor of cattle and poultry waste and make manure decompose faster.

Rice husk charcoal - Finished product

Dosage: about 20 kg rice husk charcoal /1m ^{3} manure

After mixtures of manure and rice husk charcoal had completely decomposed compost, we used it to fertilize for crops (vegetables, rice, fruit trees, etc).

19

PART 4: HOW TO MAKE AND USE *BOKASHI*-CHARCOAL ORGANIC FERTILIZER

BACH-MA -PROJECT

Tokyo University of Agriculture and Technology

Japan International Cooperation Agency

Bach Ma National Park

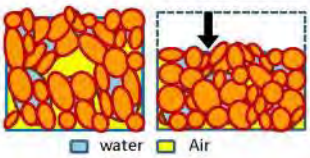
JICA Partnership Program
Technical Cooperation Project for Improving Rural Living and Nature Conservation by Multipurpose Use of Charcoal and Wood Vinegar in the Bach Ma National Park

4.1. Why should we use organic materials?

Organic matter is important to maintain soil Quality

With aggregates, soft soil!

With no aggregates, too compact soil!



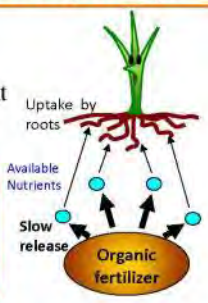
water Air

Organic materials create aggregates and improve the soil!

- Good balance between water-retention and drainage!"
- Good oxygen supply to roots!
- Making soil soft resulting in active root growth!
- Less disease!

Organic matter provide nutrients slowly to crops

- It is little washed away by rain.
- Nutrient supply continues throughout crop growth period



Important Points

- ✓ Raw organic materials are sometimes harmful to crops.
- ✓ Nutrient supply must be balanced.

Use Bokashi-Charcoal organic fertilizer!

21

4.2. What is *Bokashi*-Charcoal organic fertilizer?

- ✓ Reduce the toxicity of raw materials by fermentation.
- ✓ Mix organic materials with charcoal to keep and balance the nutrient.
- ✓ It is fermented in low temperature (50-55 °C) and is finished in 3-4 weeks. (compost are created in higher temperature and take few months to complete).

Possible Materials

Fish meal — **Combination and mixing proportion must be considered** — Vegetable waste

Feces (Cow, hog, poultry)

Rice bran, straw, husk

Charcoal

Very porous!

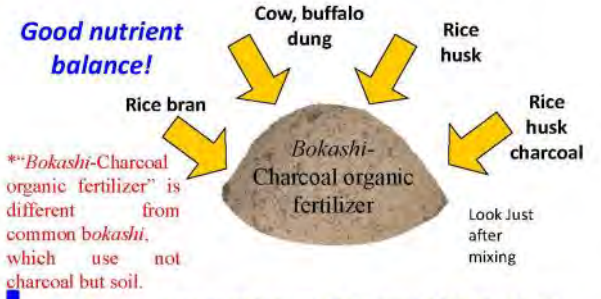
- Charcoal particles are stable and porous, and thus lead to good balance between air permeability and moisture-retaining ability
- Improve nutrient holding ability trough stimulated microbial activity and aggregate formation
- Rice husk charcoal are most suitable for composting by low alkalinity, small structure and easy carbonization process

Balance of Nutrients is important!

22

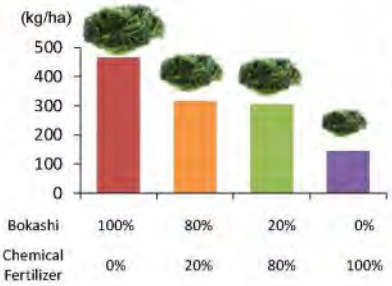
4.3. Characteristics of *Bokashi*-Charcoal organic fertilizer

- ✓ Balance the nutrient content by mixing various materials
- ✓ Reduce the toxicity of raw materials by fermentation
- ✓ Trap the nutrients by microorganisms and humus



*"*Bokashi*-Charcoal organic fertilizer" is different from common *bokashi*, which use not charcoal but soil.

Improvement of Dry matter yield of Kang Kong



Amount of Kang Kong increased after 3 times application of *Bokashi*-Charcoal.

Continuous application has improved the soil quality!

4.4. Making of *Bokashi*-Charcoal organic fertilizer

Materials

1. Rice husk 8-10 kg

3. Rice bran 10-25 kg

2. Rice husk charcoal 8-10 kg

4. Yeast 100-300 g

5. Cow/ Buffalo dung 1m^3

*cow and buffalo dung can be replaced by pig or poultry dung

4.5. Steps of making

Step 1: rice husk charcoal making.

Step 2: fermenting rice bran

Mixing rice bran, yeast and water well. The moisture in rice bran should be around 45-50%.

Step 3: mixing all materials well.

3 to 5 days after yeast addition, mix the yeast with buffalo manure, rice husk charcoal, rice husk well.

Step 4: turn *Bokashi*-Charcoal in 2-3 day intervals

The temperature of *Bokashi*-Than should be 50-55°C during fermentation.
Bokashi-Than is ready, when the temperature of *Bokashi* and the air are the same, and when it smells good.

Bokashi-than must be stored in dry condition, it is most effective after 2,5-3 months storage.

4.6. Amount of applied *Bokashi*-Charcoal organic fertilizer

Leaf vegetables
Basal application: about 40 tons/ha
Timing:
Basal application: before sowing,

Cucumber
Basal application: 2.5 kg /hill
Additional application: 1.5 kg /hill

Eggplant
Basal application: 2.5 kg /hill
Additional application: 2 kg /hill

* One hill has 2-3 plants

Timing
Basal application: before sowing,
Additional application:
10-15 days after seedling planting,
before blooming,
after having fruit, after harvesting

Application schedule in case of eggplant

Basal 2.5 kg/hill	Add 2 kg/hill	Add 2 kg/hill	Add 2 kg/hill	Add 2 kg/hill
Before planting	10-15 days after	Before blooming	After fruiting	After harvesting

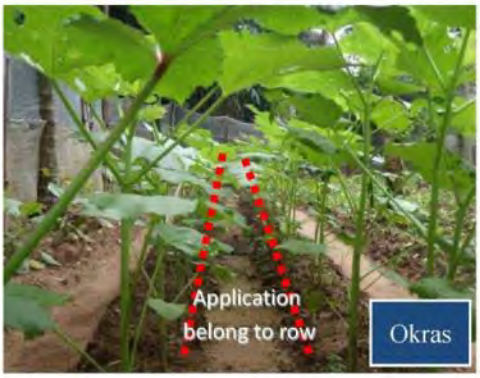
※ Amount of *Bokashi*-Than can be reduced, if additional chemical fertilizers are applied.

4.7. Method of *Bokashi*-Charcoal organic fertilizer application

4.7.1. Basal application

27

4.7.2. Additional application



28

PART 5: TECHNIQUES FOR GROWING ORGANIC VEGETABLE

BACH-MA C-PROJECT

Tokyo University of Agriculture and Technology

Japan International Cooperation Agency

Bach Ma National Park

JICA Partnership Program
Technical Cooperation Project for Improving Rural Living and Nature Conservation by Multipurpose Use of Charcoal and Wood Vinegar in the Bach Ma National Park

5.1. Techniques for growing Bok choy

5.1.1. Crop seasonal

The main crop seasonal is from December to April next year.

5.1.2. Sowing and cultivate seedling

1. Preparing

➢ Seed: firm, glossy and plump, have no disease, should buy the seed from reliable company.

➢ Soil to sowing: soil, *Bokashi*-Charcoal oganic fertilizer, rice husk, rice husk charcoal (rate 5:3:1:1).

2. Soaking seed

• Soaking the seed in the water for 10 minutes, after that is in the 54°C warm water (3 parts boiling water and 2 parts cold water) for 10-20 minutes and continue to soak them in the cold water 5-6 hours, then wash and wrap them up in the damp cloth (dip cloth in warm water and squeeze it dry), outside wrap several layers of cloth and keep it for 24 hours.

3. Cultivate seedling

After soaking (when the seed germinated), sowing the seed on the surface of the nursery garden and cover them with a layer of soil (around 1,5cm).

30

5.1.3. Preparing the soil and planting

1. Preparing the soil

➢ The soil should be plowed, harrowed well before planting about 1-2 weeks.

➢ Make bed (ridge): High bed from 10-15cm, wide bed: 80cm , wide trench from 20-25cm.

➢ Basal addlication: 1.5-2kg *Bokashi*-Charcoal/ trench.

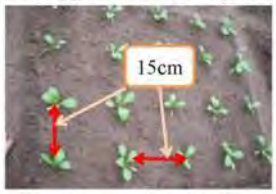
2. Planting

Planting the seedling when they have 3 true leaves (12-15 days after sowing).

Making the trench

Basal application: 1,5-2kg/rãnh

Planting



Distance planting: 15x15cm

5.1.4. Tendance

1. Irrigation

Watering two times per day in the early morning and afternoon.

2. Cleaning the field

Cutting of the leaves have disease, pest or could not have photosynthesis. Cleaning weeds on the field.

3. Additional application

7-10 days after planting, applying the additional fertilizer with the amount: 1.5-2kg *Bokashi*-Charcoal/trench.

5.1.5. Some kind of the popular pests and the ways to prevent and control

1. The popular pest

- **Insect**: Sâu xanh (*Helicoverpa armigera*), sâu tơ (*Plutella xylostella curtis*), sâu xám *(Agrotis ipsilon)*, sâu khoang *(Spodotera litura)*, rệp (aphids), bọ trĩ (thrips), bọ nhảy (*Phyllotreta Striolata)*.
- **Disease**: Bacterial soft rot , Fungal leaf blight.

2. The ways to prevent and control

a. Pest control by hand

➢ Use your hands to catch and kill insects, cut off diseased leaves and insect eggs.

➢Checking the field regularly to detect disease early.

b. Cultural methods

➢ ***Preparing the soil and field cleaning carefully:*** Exterminating germs of pests in soil and on plant remnants.

➢ ***Crop rotation:*** Changing the kind of vegetables on the same field in consecutive crops.

Ex: The rotation between Chinese cabbage and *Solanaceae* family (eggplant, tomato, chilli) will prevent *Plutella xylostella.*

➢ ***Intercroping:*** Intercropping many kind of vegetables to prevent the appearance and development of pests and diseases.

Ex: Intercropping between Chinese cabbage and *Fabaceae* family (French bean, long beeean, peanut) to prevent *Plutella xylostella*, Bacterial soft rot.

➢The seeds are healthy and good resistant to pests

➢ Suitable planting density.

➢ Fertilizer application are balanced and reasonable.

➢ Suitable mode of irrigation.

c. Using herbal extracts

Recipe 1 **Preventive objects:** soil treatment before planting.

Raw materials	Preparation	Using
- 1 liter of vinegar. - 50 liters water.	- Mix vinegar and water and stir well.	- Spray to treat pests in the soil before planting. - Spray on the early morning or afternoon.

Recipe 2 **Preventive objects:** Leafy caterpillars such as: *Helicoverpa armigera Hubner, Plutella xylostella curtis, Agrotis ipsilon, Spodotera litura.*

Raw materials	Preparation	Using
- 1 teaspoon of hot chili powder. - 1 garlic bulb - 1 Onion bulb - 1 Liter of water - 1 Tablespoon of soap. - Knives - Filter - Basins or buckets	- Mincing the onion and garlic bulb. - Add hot chili powder. - Mixing the above materials in water. - Soak for 1 hour. - Filter the mixture to get the liquid. - Add soap and stir well.	- Spray the liquid on the plants. - Spray repeat if necessary.

Source: http://www.oisat.org/control_methods/plants_in_pest_control/chili.html

---***---

5.2. Techniques for growing Eggplant

5.2.1. Crop seasonal

The main crop seasonal is from December to April next year.

5.2.2. Sowing and cultivate seedling

1. Preparing

➢ Seed: firm, glossy and plump, have no disease, should buy the seed from reliable company.

➢ Instrument: tray or pot to sowing.

➢ Soil to sowing: soil, *Bokashi*-Charcoal oganic fertilizer, rice husk, rice husk charcoal (rate 5:3:1:1).

2. Soaking seed

• Soaking the seed in the water for 10 minutes, after that is in the 54°C warm water (3 parts boiling water and 2 parts cold water) for 10-20 minutes and continue to soak them in the cold water 5-6 hours, then wash and wrap them up in the damp cloth (dip cloth in warm water and squeeze it dry), outside wrap several layers of cloth and keep it for 24-48 hours.

3. Cultivate seedling

After soaking (when the seed germinated), sowing the seed on the surface of the nursery garden or tray/pot (filled with mixed soil) and cover them with a layer of soil (around 1,5cm).

The amount of seed: 10-15gram/m^2.

5.2.3. Planting

1. Preparing the soil:

➢ The soil should be plowed, harrowed well before planting about 1-2 weeks.

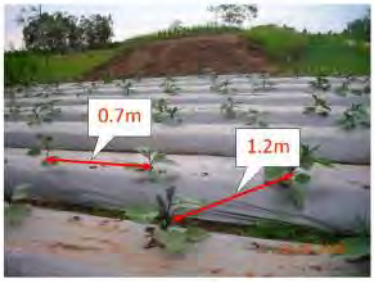
➢ Make bed (ridge): High bed from 15-20cm, wide bed: 80cm , wide trench from 40-50cm.

➢ Basal addlication: 1.5-2kg *Bokashi*-Charcoal/ trench.

2. Planting:

➢ Planting the seedling when they have 3 true leaves (40-45 days after sowing).

➢ Distance planting: plant x plant: 0.7m, row x row: 1.2m



5.2.4. Tendance

1. Irrigation

Watering two times per day in the early morning and afternoon.

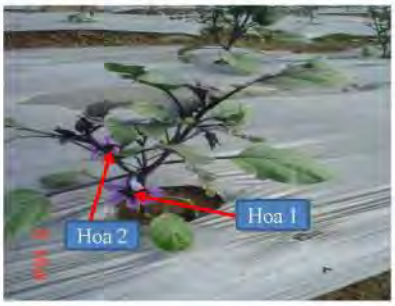
2. Pruning of branches

After plant 30-40 days, pruning useless branches and leaves near the ground, clean weeds to focus nutrition for plant and restrict pest and disease.

3. Pruning flower

After planting 35-40 days, the eggplant will have flower.

Pruning the first and the second flower to harvest at the same time.



4. Additional application

The amount: 1-2kg *Bokashi*-Charcoal/hole.

Time:

• 10-15 days after planting.

• Before having flower (30-35 days after planting).

• Almost eggplant have flower.

• After that, one time for every 15-20 days.

5.2.5. Some kind of the popular pests and the ways to prevent and control

1. The popular pest

- **Insect**: *Agrotis ipsilon, Spodoptera exigua, Spodotera litura, Heliothis armigera*, aphids, thrips.
- **Disease**: Leaf mosaic disease, leaf spot disease, wilting green disease, shoot sprout sores, fruit rot, etc.

2. The ways to prevent and control

a. Pest control by hand

➢ Use your hands to catch and kill insects, cut off diseased leaves and insect eggs.

➢ Checking the field regularly to detect disease early.

b. Cultural methods

➢ ***Preparing the soil and field cleaning carefully:*** Exterminating germs of pests in soil and on plant remnants.

➢ The seeds are healthy and good resistant to pests

➢ Suitable planting density.

➢ Fertilizer application are balanced and reasonable.

➢ Suitable mode of irrigation.

➢ ***Crop rotation*:** Changing the kind of vegetables on the same field in consecutive crops.

➢ ***Intercroping:*** Intercropping many kind of vegetables to prevent the appearance and development of pests and diseases.

Ex: The rotation or the intercroping between eggplant and Brassicaceae family (chinese cabbage, salad, radish), Fabaceae family (french bean, long bean, peanut), Cucurbitaceae family (cucumber, bitter melon, winter melon) will prevent some kind of the popular pests.

c. Using herbal extracts

Recipe 1 **Preventive objects:** soil treatment before planting.

Raw materials	Preparation	Using
- 1 liter of vinegar. - 50 liters water.	- Mix vinegar and water and stir well.	- Spray to treat pests in the soil before planting. - Spray on the early morning or afternoon

Recipe 2 **Preventive objects:** diseases by *Alternaria, Colletotrichum, Furarium.*

Raw materials	Preparation	Using
- 50g onion bulb. - 1 liter of water. - Filter. - Basins and buckets.	- Bray the onion bulb. - Add 1 liters of water. - Stir well and filter out residue.	-Spray on plants infected diseases. - Spray on the early morning or afternoon

Recipe 3 **Preventive objects:** Leafy caterpillars such as: Helicoverpa armigera Hubner, Agrotis ipsilon, Spodotera litura.

Raw materials	Preparation	Using
- 1 teaspoon of hot chili powder. - 1 garlic bulb - 1 Onion bulb - 1 Liter of water - 1 Tablespoon of soap - Knives - Filter - Basins or buckets	- Mincing the onion and garlic bulb. - Add hot chili powder. - Mixing the above materials in water. - Soak for 1 hour. - Filter the mixture to get the liquid. - Add soap and stir well.	- Spray the liquid on the plants. - Spray repeat if necessary.

Recipe 4 **Preventive objects:** *Spodotera litura Spodoptera exigua, Bemisia tabaci*, Mosaic virus.

Raw materials	Preparation	Using
- 10-20 hot chili slices. - 2-2.5kg Neem leaf - 2 teaspoons of soap. - Mortar and pestle. - Filter. - 21 liters of warter. - Basins and buckets	- Bray the hot chili and Neem leaf. - Add 1 liter of water. -Soak the mixture 1 night. - Filter out residue. - Add 20 liters of water and soap in the liquid and stir well.	- Spray on plants infected pests on the early morning or late afternoon.

Source : http://www.oisat.org/control_methods/plants_in_pest_control/chili.html

5.2.5. Harvesting and preservation

1. Harvesting

- Using the sharp knife or sharp scissors to cut.
- Should not harvest the eggplant is too young, too old, have insect and disease too much.

2. preservationing

Keep the eggplant at cool place, using the leaves to cover.

Arrange follow the V

Arrange transversal

5.3. Techniques for growing hot chilli

5.3.1. Crop seasonal

Hot chilli can be planted all year.
The main season: Winter-spring, spring- summer, summer-autumn.

5.3.2. Sowing and cultivate seedling

1. Preparing

➢ Seed: firm, glossy and plump, have no disease, should buy the seed from reliable company.

➢ Instrument: tray or pot to sowing.

➢ Soil to sowing: soil, *Bokashi*-Charcoal oganic fertilizer, rice husk, rice husk charcoal (rate 5:3:1:1).

2. Sowing

After soaking (the soaking way is the same with Eggplant), sowing the seed when it germinated:

The first way: Sowing the seedling in the trap/pot:
Fill the mixed soil in the trap/pot, sowing the seed on the surface and cover with a layer of soil (about 1-1,5cm).

The second way: Sowing in the nursery garden:
-Selecting the land is high, dry and cool, be plowed, harrowed well before planting about 1-2 weeks.
- Make bed (ridge) : high 15-20cm, wide 0,8-1m, wide of trench is 25-30cm

5.3.3. Planting

1. Preparing

- The soil is plowed, harrowed well before planting about 1-2 weeks.
- Make bed (ridge) : high 15-20cm, wide 1,2m, wide of trench is 25-30cm.

2. Planting

➢ When the seedling has 3-4 true leaves (after sowing 30-35 days), planting this on the field.

➢ Distance planting:

Plant x plant: 0,7m, row x row: 0,7m.

➢ Planting the double row.

5.3.4. Fertilizer application

Two ways: Basal and additional appication.

1. Basal application

The amount: 1,5-2kg *Bokashi*-Charcoal/hole.

2. Additional application

The amount: put *Bokashi*-Charcoal around the root 1-1,5kg/plant

Time:
- 10-15 days after planting.
- Before having flower.
- Almost hot chilli have flower.
- After harvesting.

5.3.5. Tendance

1. Irrigation

Watering two times per day in the early morning and afternoon.

2. Replace the bad one

After planting 5-7 days, replacing the bad or dead one.

3. Cut the top

When the hot chilli is high about 12-15cm, cuting the top to create more branches and increase productivity.

4. Pruning the branches, leaves, fruits

Cutting branches is un useful, have disease and insect too much to focus nutrition for plant and restrict pest and disease.

5. Clean weeds, earth up a tree

Should combine cleaning the weed with additional application earth up chilli's root.

5.3.6. Some kind of the popular pests and the ways to prevent and control

1. The popular pest

a. Insect:

Agrotis ipsilon, thrips, aphids, *Spodoptera*, *Heliothis armigera.*

b. Disease:

Black rot wilt disease, white spot disease on leaves, green death disease, young top rot disease, leaf mosaic disease anthracnose disease, white musty, grey musty.

2. The ways to prevent and control

a. Pest control by hand

➢ Use your hands to catch and kill insects, cut off diseased leaves and insect eggs.

➢ Checking the field regularly to detect disease early.

b. Cultural methods

➢ ***Preparing the soil and field cleaning carefully:*** Exterminating germs of pests in soil and on plant remnants.

➢ The seeds are healthy and good resistant to pests

➢ Suitable planting density.

➢ Fertilizer application are balanced and reasonable.

➢ Suitable mode of irrigation.

➢ ***Crop rotation:*** Changing the kind of vegetables on the same field in consecutive crops.

➢ ***Intercroping:*** Intercropping many kind of vegetables to prevent the appearance and development of pests and diseases.

***Ex*:** The rotation or the intercroping between eggplant and Brassicaceae family (chinese cabbage, salad, radish), Fabaceae family (french bean, long bean, peanut), Cucurbitaceae family (cucumber, bitter melon, winter melon) will prevent some kind of the popular pests.

c. Using herbal extracts

Recipe 1 **Preventive objects:** diseases by *Alternaria, Colletotrichum, Furarium.*

Raw materials	Preparation	Using
- 50g onion bulb. - 1 liter of water. - Filter. - Basins and buckets.	- Bray the onion bulb. - Add 1 liters of water. - Stir well and filter out residue.	-Spray on plants infected diseases. - Spray on early morning or late afternoon.

Recipe 2 **Preventive objects:** soil treatment before planting.

Raw materials	Preparation	Using
- 1 liter of vinegar. - 50 liters water.	- Mix vinegar and water and stir well.	- Spray to treat pests in the soil before planting. - Spray on the early morning or afternoon

Source : http://www.oisat.org/control_methods/plants_in_pest_control/chili.html

5.3.7. Harvesting

- Young fruit are white. Harvesting when the fruit are green or yellow (get old).

- Using the sharp knife or sharp scissors to cut.

- Should not harvest the eggplant is too young, too old, have insect and disease too much.

---***---

5.4. Techniques for planting Cucumber

5.4.1. Crop seasonal

Can be planted all year. The main season is from November to next year April.

5.4.2. Sowing and cultivate seedling

1. Preparing the seed

Seed: firm, glossy and plump, have no disease, should buy the seed from reliable company.

Soaking:

• Soaking the seed in the water for 10 minutes, after that is in the 54°C warm water (3 parts boiling water and 2 parts cold water) for 10-20 minutes and continue to soak them in the cold water 5-6 hours, then wash and wrap them up in the damp cloth (dip cloth in warm water and squeeze it dry), outside wrap several layers of cloth and keep it for 24 hours.

2. Sowing

After soaking, sowing the seed when it germinated:

The first way: Sowing the seedling 3-5 cm deep in the plasstic bag (diameter 25-30cm) is filled with the mixed soil (follow "Preparing the soil"). 2-3 seeds/bag.

The second way: Sowing directly in the hole on the field. 2-3 seeds/hole.

3. Soil preparing

➢ The soil to sowing: soil, *Bokashi*-Charcoal, rice husk, rice husk charcoal.

➢ make bed (ridge): high 10-15cm, wide 80cm,wide of trench 25-30cm.

Planting cucumber in the plastic bag

Planting cucumber on the bed

➢ Distance planting: plant x plant: 30-40cm, row x row: 70-80cm.

5.4.3. Fertilizer application

▪ **Basal application**

Spread *Bokashi*-Charcoal on the surface of the bed (thick 2cm) and mix it with the top soil well.

Application in the hole: 1,5-2kg *Bokashi*-Charcoal/hole.

▪ **Additional application:**

The period to apply:

- The first time: having 3 true leaves.
- The second time: cucumber start to climd on the trallis.
- The third time: Almost cucumber has flower.
- The next times: After the first harvesting, apply every 15-20 days /time fertilizer

The amount: 1-1.5kg *Bokashi*-Charcoal/hole

5.4.3. Tendance

1. Irrigation

Watering two times per day in the early morning and afternoon.

2. Reseed:

After sowing 4-5 days, reseeding into holes that seeds did not germinate. After sowing 10-12 days (three true leaves), take out the bad one and keep 1-2 plant per hole or bag.

3. Making trellis

When the plant has cirri, beginning to make trellis

4. Cleaning the field and earth up a plant

Cutting of the leaves have disease, pest or could not have photosynthesis. Cleaning weeds on the field and earth up a plant.

5.4.4. Some kind of the popular pests and the ways to prevent and control

1. The popular pest

a. *Insect*

Agrotis ipsilon, cricket (often appears period sapling). *Spodotera liture*, thrips, aphiders, *Aulacophora similis, Liriomyza trifolii*.

b. Disease

Leaf mosaic disease (virus), white powder disease (*Hyaloperonospora brassicae*), mildew, wilting green disease, wilting yellow disease, die nurseling

Liriomyza trifolii

Aulacophora similis

2. The ways to prevent and control

a. Pest control by hand

➢ Use your hands to catch and kill insects, cut off diseased leaves and insect eggs.

➢ Checking the field regularly to detect disease early.

b. Cultural methods

➢ ***Preparing the soil and field cleaning carefully:*** Exterminating germs of pests in soil and on plant remnants.

➢ The seeds are healthy and good resistant to pests

➢ Suitable planting density.

➢ Fertilizer application are balanced and reasonable.

➢ Suitable mode of irrigation.

➢ ***Crop rotation:*** Changing the kind of vegetables on the same field in consecutive crops.

➢ ***Intercroping:*** Intercropping many kind of vegetables to prevent the appearance and development of pests and diseases.

Ex: The rotation or the intercroping between cucumber and chrysanthemum or *Brassicaceae* family (bok choy, salad, radish) or *Solanaceae family* will prevent some kind of the popular pests, especially *Aulacophora similis*.

c. Using herbal extracts

Recipe 1 **Preventive objects:** soil treatment before planting.

Raw materials	Preparation	Using
- 1 liter of vinegar. - 50 liters water.	- Mix vinegar and water and stir well.	- Spray to treat pests in the soil before planting. - Spray on the early morning or afternoon

Recipe 2 **Preventive objects:** Leafy caterpillars such as: Helicoverpa armigera Hubner, Agrotis ipsilon, Spodotera litura.

Raw materials	Preparation	Using
- 1 teaspoon of hot chili powder. - 1 garlic bulb - 1 Onion bulb - 1 Liter of water - 1 Tablespoon of soap - Knives - Filter - Basins or buckets	- Mincing the onion and garlic bulb. - Add hot chili powder. - Mixing the above materials in water. - Soak for 1 hour. - Filter the mixture to get the liquid. - Add soap and stir well.	- Spray the liquid on the plants. - Spray repeat if necessary.

Source : http://www.oisat.org/control_methods/plants_in_pest_control/chili.html

5.4.5. Harvesting and preservation

1. Harvesting

- Using the sharp knife or sharp scissors to cut.
- Should not harvest the eggplant is too young, too old, have insect and disease too much.
- Harvesting on the early morning or late afternoon.

2. Preservation

Keep the eggplant at cool place, using the leaves to cover.

---***---

5.5. Techniques for planting French bean

5.5.1. Crop seasonal

Can be planted all year.
The main season is Winter-Spring, begin at the end of lunar October.

5.5.2. Preparing the soil

- Select the land is high, good drainage.
- Tilling carefully and cleaning the grass.
- ***Making bed:*** high 15-20cm, wide 80cm, wide of trench is 20-25cm.
- ***Distance planting:*** Planting double row: row x row: 1 - 1,2 m, hole x hole 20 -25cm.

5.5.3. Fertilizer application

- **Basal application**: từ 1,5 - 2kg/hốc.
- **Additional application:** about 1-1,5kg *Bokashi*-charcoal/hole in the following period:
  + Having three true leaves.
  + After planting 20-25 days.
  + Almost of palnt have flower and have the first fruits.
  + After the first harvesting.

5.5.4. Sowing

- Seed: firm, glossy and plump, have no disease, should buy the seed from reliable company.
- Treatment the seed with 1% salt water for 10 minutes, remove seeds are floating on the water, husky, bad seed.
- Seeds are soaked in warm water (3 parts boiling water and 2 parts cold water) about 1 hour. Then seeds are filtered out of the water, keep warm the seeds in a damp cloth, wait seeds begin to germinate, sowing in the hole on the field: 2-3 seeds/hole.

5.5.5. Tendance

1. Reseed:
After sowing 4-5 days, reseed in the hole had no seed germinate

2. Irrigation

Watering two times per day in the early morning and afternoon.

Need to watering enough when the french bean have a lot of flower and fruit. If french bean lack of water, it will grow slowly, have small fruit, reduce yield and quality of fresh fruits.

3. Making trellis

When the plant has cirri, beginning to make trellis: high 2,5-3m, X-shaped.

4. Cleaning the field and earth up a plant

Cutting of the leaves have disease, pest or could not have photosynthesis. Cleaning weeds on the field and earth up a plant.

5.5.6. Some kind of the popular pests and the ways to prevent and control

1. **Insect:** *Ophiomyia phaseoli, Maruca testulalis.*

- ***Some methods to control and prevent:*** Should be planted early, cleaning the field well, cutting the leaves and plant have pests too much, crop rotation, intercroping adjusting suitable planting density. Using herbal extracts.

2. **Disease:** Wilting nurseling disease (*Rhizoctonia solani)*, leaves spot disease by bacterial (*Xanthomonas phaseoli*), leaves spot disease by fungus (*Cercospora canescens* và *Cercospora cruenta)*, white powder disease by fungus (*Erysiphe poligoli).*

- ***Some methods to control and prevent:*** Should be planted early, cleaning the field well, crop rotation, intercroping, adjusting suitable planting density. Using herbal extracts.

3. *Using herbal extracts*

Recipe 1 **Preventive objects:** soil treatment before planting.

Raw materials	Preparation	Using
- 1 liter of vinegar. - 50 liters water.	- Mix vinegar and water and stir well.	- Spray to treat pests in the soil before planting. - Spray on the early morning or afternoon

Recipe 2 **Preventive objects:** *Spodotera litura Spodoptera exigua*, *Bemisia tabaci*, Mosaic virus.

Raw materials	Preparation	Using
- 10-20 hot chili slices. - 2-2.5kg Neem leaf - 2 teaspoons of soap. - Mortar and pestle. - Filter. - 21 liters of warter. - Basins and buckets	- Bray the hot chili and Neem leaf. - Add 1 liter of water. -Soak the mixture 1 night. - Filter out residue. - Add 20 liters of water and soap in the liquid and stir well.	- Spray on plants infected pests on the early morning or late afternoon.

Source : http://www.oisat.org/control_methods/plants_in_pest_control/chili.html

---***---

5.6. Techniques for planting Winter melon

5.6.1. Crop seasonal

The winter melon can be grown anytime in the year, but the best season is "winter-spring" season (from November to December).

5.6.2. Soil preparation

- Choose elevated areas, good drainage.
- Plowed carefully and clean the grass.
- ***The bed***: 15-20cm high and 1.2m wide.
- ***Distance planting:*** growing single line, plant x plant: about 40cm.

5.6.3. Fertilizer application

- **Basal application**: từ 1,5-2kg *Bokashi*-Charcoal/hole.
- **Aditional application:** about 1-1,5kg *Bokashi*-charcoal/hole in the following period:

+ After planting 10-15 days.
+ After planting 30 days.
+ After the first harvesting.

After that, one time for every 15 days.

5.6.4. Sowing

Select the seeds which is firm, glossy and plump. Should buy the seed from the reputable companies.

Treating the seeds with 1% salt water for 5 minutes, remove floating on the water surface.

Soaking: Soak seeds in warm water (2 parts boiling water + 3 parts cold water) for about 4-6 hours, then take out and there are two ways:

The first way: Sowing the seed directly on the field or sow in pots

The second way: After we soak the seeds in warm water, take them out, wash and wrap them up in the damp cloth (dip cloth in warm water and then squeeze it dry), outside wrap several layers of cloth to keep the moisture for 36-48 hours to germinate. Then, sowing them on the field or pot.

The amount of sowing: (2-3 seed/hole or pot).

5.6.5. Tendance

1. Reseed:

Reseeding after sowing 4-5 days.

2. Irrigation

Watering two times per day in the early morning and afternoon. When winter melon have a lot of flower and fruit, they need more water.

3. Making trellis

When the plant has cirri, beginning to make trellis: high 2,5-3m, T-shaped.

4. Cleaning the field and earth up a plant

Cutting of the leaves have disease, pest or could not have photosynthesis. Cleaning weeds on the field and earth up a plant.

5.6.6. Some kind of the popular pests and the ways to prevent and control

The pest on the winter melon is not much but we still should check the pest situation on them.

1. The popular pest:

Insects: thrips, *Amrasca devastans Distant*, *Aphis gossypii Glover*, *Leptocorisa oratorius*.

Diseases: *Rhizoctonia solani*, *Colletotrichum sp*, *Pseudo peronospora cubensis*, *Erysiphe cichoracearum*.

2. Some methods to control and prevent

a. Pest control by hand:

➢ Use your hands to catch and kill insects, cut off diseased leaves and insect eggs.

➢ Checking the field regularly to detect disease early.

b. Cultural methods

➢ Land preparation and field cleaning carefully: Exterminating germs of pests in soil and on plant remnants.

➢ ***Crop rotation***: Changing the kind of vegetables on the same field in consecutive crops.

➢ ***Intercroping:*** Intercropping many kind of vegetables to prevent the appearance and development of pests and diseases.

Ex: The rotation or the intercroping between winter melon and Brassicaceae family (chinese cabbage, salad, radish) to prevent some kind of the popular pests.

➢ The seeds are healthy and good resistant to pests.

➢ Suitable planting density.

➢ Fertilizer application are balanced and reasonable.

➢ Suitable mode of irrigation.

3. *Using herbal extracts*

Recipe 1 **Preventive objects:** soil treatment before planting.

Raw materials	Preparation	Using
- 1 liter of vinegar. - 50 liters water.	- Mix vinegar and water and stir well.	- Spray to treat pests in the soil before planting. - Spray on the early morning or afternoon

Recipe 2 **Preventive objects:** diseases by *Alternaria, Colletotrichum, Furarium.*

Raw materials	Preparation	Using
- 50g onion bulb. - 1 liter of water. - Filter. - Basins and buckets.	- Bray the onion bulb. - Add 1 liters of water. - Stir well and filter out residue.	-Spray on plants infected diseases. - Spray on early morning or late afternoon.

Source: http://www.oisat.org/control_methods/plants_in_pest_control/chili.html

5.6.7. Harvesting

- Winter melon harvest depending on the characteristics of each type and characteristics of the local customs. Generally after flowering and fruit setting of 50 - 60 days can be harvest.

- Using the sharp knife or sharp scissors to cut.

- Should not harvest the winter melon fruit is too young, too old, have insect and disease too much.

- Harvesting on the early morning or late afternoon.

---***---

5.7. Techniques for planting Sprout

5.7.1. Crop seasonal

The winter melon can be grown anytime in the year.

5.7.2. Preparing the material

1.Straw

2.Rice husk charcoal

3. Wood vinegar

4. Seed (white radish)

5. Sprayer

6. Polystyrene box

7. Tissue paper

5.7.3. Making mixed material

1. Mixing ratio of raw material:

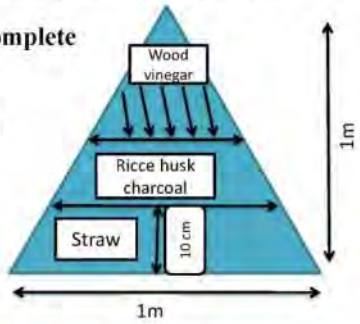
Dry straw: 1m^3, Wood vinegar: 1 liter (mix with enough water to wet all material), Rice husk charcoal: 10-15 kg.

2. How to mix material

Spread a layer of dry straw and a layer of rice husk charcoal on dry straw, spray wood vinegar on the surface. Continue to the 2nd, 3rd time until they are 1m high.

• **The time material complete**

Depending on material, about 30-45 days.



5.7.4. Soaking seeds

• **Select the seed:** firm, glossy and plump. Should buy the seed from the reputable companies

• **Soaking:** Soaking the seed in the water for 3-6 hours, after that is in the 54°C warm water (3 parts boiling water and 2 parts cold water) for 20-30 minutes and continue to soak them in the cold water 18-21 hours (if the water have foam or bad smell, changing the water), then wash and wrap them up in the damp cloth (drop cloth in warm water and squeeze it dry), outside wrap several layers of cloth and keep it until the seed germinate.

5.7.5. Planting

Steps to growing vegetables sprouts as follows:

1. Spread the mixed material in polystyrene box with 3-5cm thick, use hand to make the surface smooth

2. Cover with paper and spray water to wet well.

3. Spread the seed all surface of the box and spray a little water.

4. Kept tightly closed in 2-3 days.

The sprout after planting 2-3 days.

After planting 6-7 days, the sprout can be harvested.

• The sowing amount of seed: Depends on the size of box
• Water: light spray 1-2 time(s)/ day, sprouts always must be kept wet.

5.7.6. How to prevent and control pests on sprouts

The sprouts is a very short-term vegetable (from 6 to 8 days), so generally they do not have many pest. However, we still need to notice to some problems when we produce sprouts to limit the emergence and development of pest as follow:

*** Mixed material (rice husk charcoal, dry raw and vinager)**

➢ The mix material needs to be processed properly to kill the germ insect.

➢ Do not use many times the mix materials without handle it.

Handle the material after harvesting: after harvesting, dried the old material and add ½ new material to re-use.

*** Tendance**

➢ Wartering for the sprouts is enough, put the sprout box in a cool place and avoid where the humidity is too high.

➢ Avoid touching or scratched the sprouts because this will facilitate pathogen infection.

5.7.7. Harvesting and preservation

• Harvesting the sprouts at the recommended time, the sprouts should not be too old.
• Harvesting: using sharp knife, scissors to cut slose stump.
• Preservation: keep sprout at the cool place and use withing 24h after harvesting

---***---

Appendix:
Pictures of some common pests on vegetables

Sâu xanh
(*Spodoptera exigua*)

Sâu tơ
(*Plutella xylostella)*

Sâu khoang
(*Spodoptera litura)*

Sâu xám
(*Agrotis ipsilon)*

Bọ xít đỏ
(*Dysdercus cingulatus*)

Bọ dưa
(*Aulacophora similis*)

LIST OF THE EDITORS AND SUPERVISORS

This is to extend my sincere gratitude to those who rendered great services in making this textbook so informative and helpful. This textbook is a compilation of diverse training materials used for CEFL – model training workshops instructed by Bach Ma Charcoal Project in Vietnam. In reward for all editors and supervisors listed here, I hope this book will be used by many people who aim organic farming: easy, reasonable, efficient, and healthy for both you and nature environment.

Yosei Oikawa
Project Manager of Bach Ma Charcoal Project

PART 1 – THE INTRODUCTION ABOUT THE CEFL MODEL
Edited by Atsuko Saito, Former Coordinator, Bach Ma Charcoal Project

PART 2 – CHARCOAL AND ITS APPLICATION
Edited by Phan Vo Bao Dan, Field Instructor; Phan Ve, Field Adviser;
and Phan Quoc Dung, Former Project Staff of Bach Ma Charcoal Project (BMCP).
Supervised by Yosei Oikawa, PhD., Assistant Professor, Institute of Agriculture,
Tokyo University of Agriculture and Technology (TUAT)

PART 3 – LIVESTOCK HYGIENE USING CHARCOAL
Edited by Nguyen Thi Doan Ngoc, Field Instructor; and Dang Thi Nguyen Thao, Field Adviser, BMCP.
Supervised by Hideki Hayashidani, PhD., Associate Professor, Institute of Agriculture, TUAT
and Vo Thi Minh Tam, Researcher, Hue University of Agriculture and Forestry (HUAF).

PART 4 – HOW TO MAKE AND USE *BOKASHI* – CHARCOAL ORGANIC FERTILIZER
Edited by Pham Quang Sanh, Former Project Staff, Bach Ma Charcoal Project
The method of the *Bokashi*-Charcoal Organic Fertilizer, original in this textbook, was made
and introduced by Mr. Shugo Hama, Former Organic Agriculture Expert of BMCP.
Supervised by Kimura Sonoko Dorothea, PhD., Associate Professor, Institute of Agriculture, TUAT

PART 5 – TECHNIQUES FOR GROWING ORGANIC VEGETABLES
Edited by Nguyen Duy Huy Hoang, Field Instructor; Nguyen Thi Doan Ngoc, Field Instructor;
and Nguyen Thi Quyen, Former Project Staff, BMCP
Cultivation Part :
Supervised by Tran Thi Le, PhD., Associate Professor, HUAF,
and Sakae Suzuki, PhD., Lecturer , Institute of Agriculture, TUAT
Pest-control Part:
Supervised by Le Dinh Huong, PhD., Senior Lecturer, HUAF, Madoka Nakai PhD., Associate Professor,
Institute of Agriculture, TUAT and Le Van Vang, PhD., Can Tho University

Awarding the "CEFL-model Technical Instructor Certificate" at the Final Workshop

CEFL-model Farms applying the Project's unique techniques.

The farmers introduced their products at Hue Festival, 2012

The farmers introduced their products at the local market (Cau Hai market, Phu Loc district, Thua Thien Hue province)

BACH-MA Forest PROJECT
DỰ ÁN THAN BẠCH MÃ

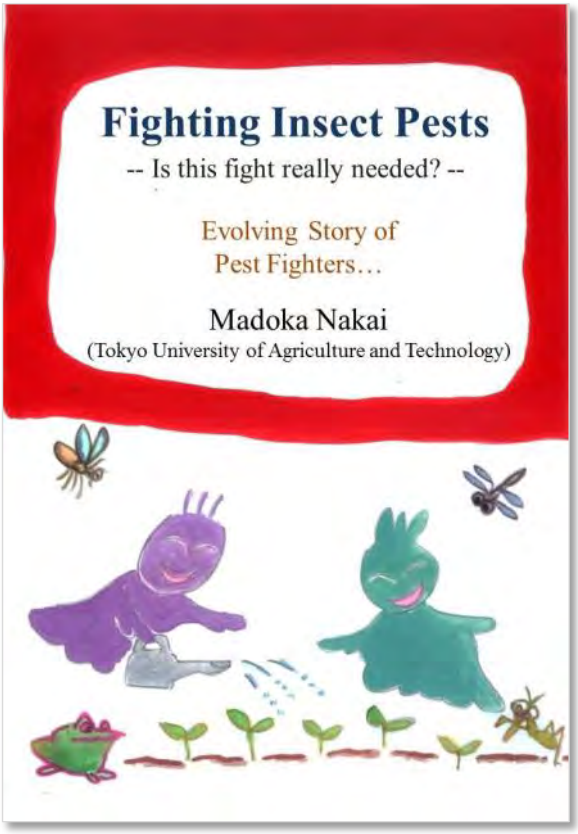
JICA Partnership Program

BACH MA CHARCOAL PROJECT

Technical Cooperation Project for Improving Rural Living and Nature Conservation by Multipurpose Use of Charcoal and Wood Vinegar in the Bach Ma National Park

Address : Bach Ma National Park, Phu Loc District, Thua Thien Hue Province, Vietnam.
Email : thanbachma@gmail.com

❑ 親子で学ぶ教材絵本「Fight with Insect Pests」



CEFL モデルは基本的には農薬に頼らない農業を目指していますが、過渡期においては全く農薬を使わないわけにはいきません。農薬を正しく効果的に使う方法を学ぶことは非常に重要です。

ベトナムに限らず世界中で見られる農薬の誤った使用例を元にして物語を考案しました。そして、子供も大人も一緒に楽しく学べる絵本を作りました。この絵本を通して、正しい知識を得て頂きたいと思います。

現地ではベトナム語で作成して配布しましたが、掲載の絵本はベトナム語を英訳したものです。

仲井まどか

Kyoko realized the dangers of chemical pesticides.

Kyoko felt unwell, because she was not protected.
(She used lots of chemical pesticides without dilution!)

And the pesticide killed other creatures.

That night Kyoko was sick.

Kyoko was suffering from the chemical pesticide. Madoka was not.

Madoka went out to get a doctor for Kyoko.

Now, Kyoko was afraid of the chemical pesticide, and diluted it too much with water.

The dilution should be 1000 times!

This pesticide is dangerous and should be diluted 1 million times!

But the caterpillars were not killed.

It means:

Chemical pesticide should be diluted according to the instruction on the bottle.

If the pesticides is too diluted, the pest caterpillars are not killed but only harmless animals are killed.

Afterwards,
Madoka learnt from their failure.

Madoka read the label on the bottle of chemical pesticides, and followed its instruction.

But Kyoko still did not read anything!

8

What happened? → No pests were killed.

Even after that, Kyoko continued to make mistakes.

For example ...

9

While Madoka was harvesting vegetables,
Kyoko sprayed pesticide on them.

10

Vegetables sprayed with chemicals too close to harvesting time are not suitable for selling or eating!

11

Kyoko's little brother is trying to get poison (chemicals) from the food shelf.

Don't use food bottles to store pesticides.

12

Madoka keeps chemical pesticides locked in her safe.

13

There were only a few pest insects in Kyoko's garden.
But even so, Kyoko sprayed chemical pesticide.

14

Because the cost of chemical pesticides is higher than the benefit of pest control.

Chemical pesticides kill natural enemies, which are often more susceptible against chemicals than pest insects.

15

Kyoko thought she had learned everything about chemical pesticides.

16

There are a lot of things Kyoko did not know, such as:

Children should never touch empty bottles or packages of chemical pesticides!

Chemical pesticides are poisonous to humans.

17

Afterward, Kyoko tried very hard to reduce chemical pesticides.

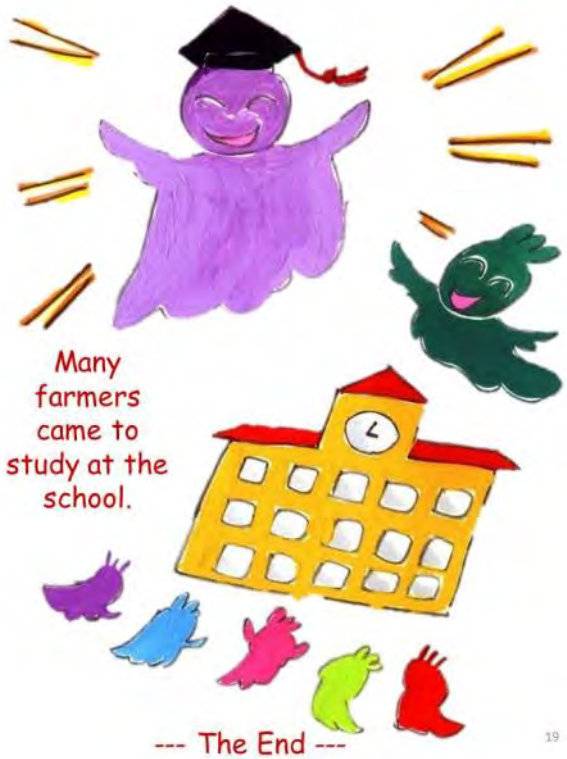
Use a net to keep the pests out!

This is "mix cropping" with leeks and cucumbers.

Kyoko's farm has lots of natural enemies, which fight the pest insects.
So she did not need to use much chemical pesticide any more.

18

Finally, Kyoko founded an agriculture school.



19

My special thanks to Ms. Shinako Naka and Ms. Kyoko Shii for their fascinate ideas to give birth to this book, and to Ms. Nguyen Thi Doan Ngoc for her excellent translation in Vietnamese and Dr Ian Smith in English.

--- Madoka Nakai--

第５部　　活動のまとめ

❑ プロジェクトに参加して

ケースー集落長：Nguyen Tham

2008 年 7 月から 2013 年 3 月までバックマー・チャコールプロジェクトに携わったケースー集落住民・農家を代表し、プロジェクト関係者の皆様に深く感謝申し上げます。

私たちは、本プロジェクトによる研修会や様々な活動に参加することで、多くのことを学ばせていただきました。代表的なものに、有機肥料のボカシ炭の作り方、ショウガ・ニンニク・トウガラシ・ニームの種から自然農薬を作り有機野菜を栽培する方法、化学肥料や化学農薬を使わない農法などがあげられます。また、ベトナム国内（ダラット、ハノイ、マイチャウ）や海外（カンボジア）への先進地研修では、大変有意義な勉強や素晴らしい体験をさせていただきました。

現在、プロジェクトの指導による CEFL モデル実践農家はケースー集落だけでも 10 軒を数え、有機野菜の収量は家庭用の需要量を超え、地元のカウハイ市場をはじめフエ市内、ダナン市内でも販売できるようになりました。また、フーロック地区の他の村落やナムドン地区にまでこのモデルが普及され、多くの農産物生産者や消費者に有機野菜の価値を教え、環境に優しい作物への意識を向上させました。

これらは全てプロジェクトの活動により成し遂げられたことです。今後、この成果を維持するだけではなく、常に改良を加え、「健康に良い」と消費者から高い評価が得られるような高品質の作物を栽培するよう、努力していきたいと思います。また、近隣地域への普及にも力を注ぎ、プロジェクトの成果を維持・発展させていきたいと考えております。

5 年間にわたりプロジェクトを運営くださったバックマー国立公園、東京農工大学、JICA の皆々様、また常に真摯にご支援・ご指導くださったスタッフの皆さまに、改めて、心より御礼申し上げます。

ＣＥＦＬ実践農家・インストラクター代表：Cao Thanh

バックマー・チャコールプロジェクト関係者の皆さまには、たくさんのご支援をいただき、心から感謝申し上げます。私たちは、プロジェクトを通じて日本の技術を利用した家畜飼養（養豚）、炭入り有機肥料「ボカシ・タン」や自然農薬を使った栽培や害虫防除など、有機農業に役立つ様々な有益な技術を学ぶことができました。

また、内容豊富な先進地視察研修に参加する機会をいただき、特に、ベトナム国内のみならず海外からのツーリストも見据えた「有機農業とエコツーリズム」の先進地視察研修では、有機野菜の栽培をエコツーリズムとして効率的にとらえることで持続可能な発展ができることを学ぶことができました。

私たちケースー集落の CEFL モデル実践者は、このモデルのインストラクターとしてフーロック地区の他の村落やナムドン地区への普及活動のお手伝いもさせていただきました。4 年以上続けてきた今、私たちの活動がバックマー国立公園緩衝地帯の住民や農家に大きな影響を与えてきたことに気づき、あらためて、プロジェクト関係者の全ての方々に心からの御礼を申し上げる次第です。

私たちはプロジェクトから学んだ技術を継続し、有機農業の発展と美しい自然環境の保全のため、最善を尽くすことをお約束します。

❑ 活動成果と今後の課題

プロジェクトマネージャー：及川洋征

事業終了までの活動成果は、これまで述べたとおりであるので、その後に確認された事業後の課題を述べ、結びにかえたい。

① 2013 年 5 月 17 日、JICA 地球ひろばにおいて業務完了報告会が開催され、本事業の成果に関して JICA 地球ひろばと同ベトナム事務所の担当者らから講評いただいた。大学が取り組んだ事業の特徴として、実証データに基づいた普及手法を評価いただいた。一方で、今後の課題として、

- 資金を持たない農家が野菜栽培や家畜生産を始めるための支援
- 販売協力・地域ブランド化の方策

の２点を指摘いただいた。モデル農家から周辺農家への波及、農家ネットワーク構築による生産販売の増強とブランド化は、先行事業を総括した際も、メンバー間で確認した将来課題であった。今後、生産技術に加えて経営・マーケティング分野での協力活動が必要と考える。

② 2013 年 8 月に、フエ農林大学 Dr. Huong の案内によりフエ市近郊の農家・団体を視察した。プロジェクトスタッフの Mr. Hoang とはケースー集落を再訪した。プロジェクトの成果と今後の課題を再確認した。

フエ市近郊における有機米生産は、先行事業の波及効果として、フォローアップ事業実施期間中も、Phu Thanh などいくつかの農協において続けられていた。最終ワークショップが行われた２月に Dr. Huong と Thuy Duong, Thuy Thanh, Thuy Van, Quang Dien の４箇所のジャポニカ稲有機栽培農家圃場、フエ市屠殺場のボカシ生産、Duc Son 孤児院の有機菜園を視察した。８月にはさらに、カトリック修道院の附属農場、印刷会社の会長が経営する果樹園とアカシア・沈香植林地に囲まれた養豚施設、フエ在住の文化人や資産家の集会施設に付随する有機菜園を見学した。フエ市近郊の各所に、有機農業に関心をもつ人々の拠点が着実に形成されている。

一方、ケースー集落のモデル農家は、乾季の高温と降雨不足のなか、野菜の生産は自給中心であり、販売は一部の農家に限られていた。炭入りボカシづくりとその施用が続いていることを確認したが、今回面会した４戸の農家からは、以下の課題を抱えていた。

・炭入りボカシづくりには手間と時間（３週間以上）がかかるわりに、地元カウハイ市場では有機野菜に高い値を付けられないので儲からない。オーガニックマーケットのような生産物をより高く売れる販売先がほしい。

・種子代・ボカシ材料代が負担で、かつ充分な利益が出せないので、労働者を雇えない。

・結果として、販売用にまとまった量の野菜を生産できない。

・手間のかかる炭入りボカシの代わりに乾燥豚糞を使って有機栽培を続けている。野菜よりも果樹・芋類を中心に栽培している。

炭を用いた農作物栽培・家畜飼育栽培と、農産物の地元での販売活動はある程度根付いてきたと考えられる。ただし、付加価値をつけた販売には、ポストハーベスト・加工技術、輸送・流通ルート、販売先の開拓等の課題が残されている。

③ バックマー国立公園では、３年間の道路拡幅工事が完了し、広い駐車場を整備して、多くの観光客がシャトルバスで山頂に上がれるようになった。国立公園での観光客の自然体験と、緩衝地帯農村での有機農産物生産・農村体験による協業は、これから取り組んでいけるものと考える。

2014 年 2 月には、JICA 大学生国際協力フィールド・スタディ・プログラムが、公益社団法人日本ユースリーダー協会により企画されている。日本人学部生 22 名が、バックマー国立公園およびケースー集落周辺での農村・自然体験に参加するとのことである。

国立公園とその周辺での自然・農村体験には、本プロジェクトが中心となって取り組んできた環境保全型農業の研修プログラムや啓発啓蒙活動を活用できると考えられる。研修実施の調整業務は、プロジェクト事務局からバックマー国立公園に引き継がれている。

今後、教育・研究・社会貢献のさまざまな課題に取り組んでいくため、本学大学院農学研究院では、バックマー国立公園との学術交流協定の締結手続きを進めている。この枠組を活用して、本学や姉妹校であるフエ大学の協力者とともに、地域貢献・活性化への参画を続けていく所存である。

国立大学法人　東京農工大学

「農民参加型木炭多用途利用技術普及計画（フォローアップ）事業報告書」
東京農工大学大学院農学府国際技術協力支援室　　平成 25 年 11 月発行
〒183-8509 東京都府中市幸町３－５－８
URL: http://www.tuat.ac.jp/~bachma