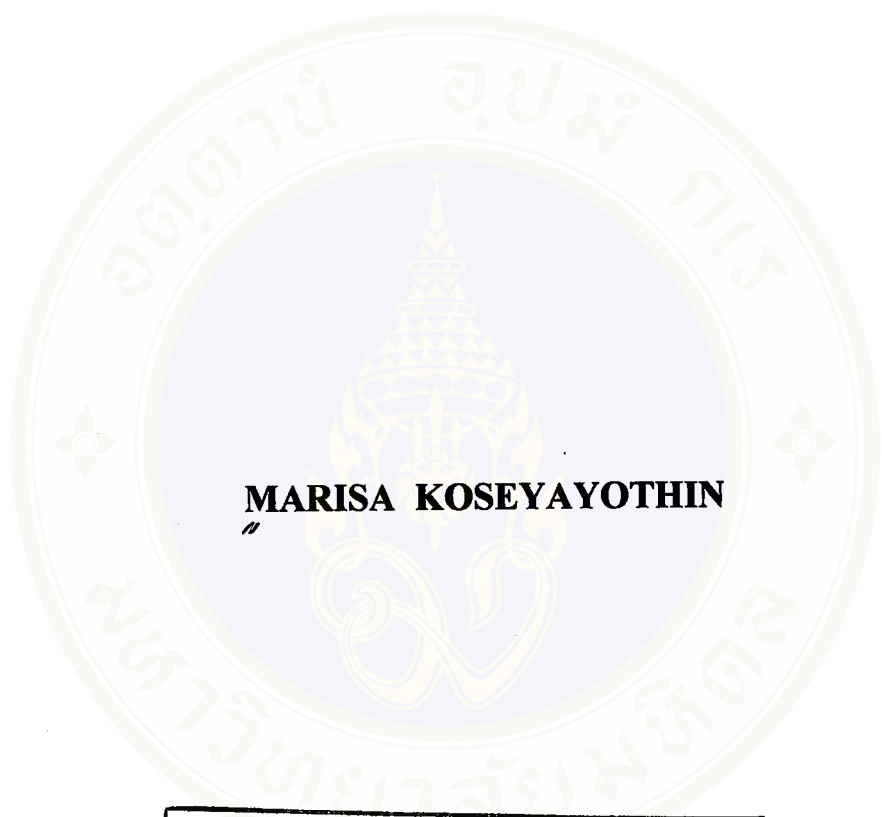


4 JAN 2001



**PARTICIPATORY ACTION RESEARCH ON NATURE FARMING  
FOR AGRICULTURAL HOUSEHOLDS IN  
THAI-CAMBODIA BORDER AREAS**



**MARISA KOSEYAYOTHIN**

อภิชนันท์นาคกร  
จาก  
บัณฑิตวิทยาลัย มหาวิทยาลัยมหิดล

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF  
THE REQUIREMENTS FOR THE DEGREE OF  
DOCTOR OF EDUCATION (ENVIRONMENTAL EDUCATION)  
FACULTY OF GRADUATE STUDIES  
MAHIDOL UNIVERSITY**

**2000**

**ISBN 974-664-903-5**

**COPYRIGHT OF MAHIDOL UNIVERSITY**

TH

M942p

2000

46625

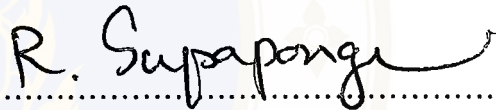
Thesis  
entitled

**PARTICIPATORY ACTION RESEARCH ON NATURE FARMING  
FOR AGRICULTURAL HOUSEHOLDS IN  
THAI-CAMBODIA BORDER AREAS**



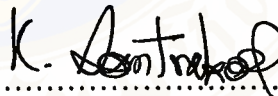
.....

Mrs. Marisa Koseyayothin  
Candidate



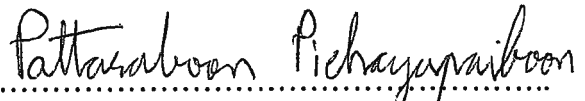
.....

Assoc Prof. Rachanont Supapongpichate, Ph.D.  
Major-advisor



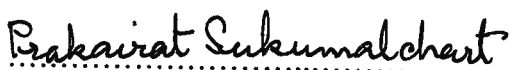
.....

Kla Somtrakul, Ed.D., Ph.D.  
Co-advisor



.....

Lect. Pattaraboon Pichayapaibul, Ed.D.  
Co-advisor



.....

Asst. Prof. Prakairat Sukumalchart, M.S.  
Acting Dean  
Faculty of Graduate Studies



.....

Assoc Prof. Rachanont Supapongpichate, Ph.D.  
Chairman  
Doctor of Education Programme in  
Environmental Education  
Faculty of Social Sciences and Humanities

Thesis  
entitled

**PARTICIPATORY ACTION RESEARCH ON NATURE FARMING  
FOR AGRICULTURAL HOUSEHOLDS IN  
THAI-CAMBODIA BORDER AREAS**

was submitted to the Faculty of Graduate Studies, Mahidol University  
for the degree of Doctor of Education (Environmental Education)

on  
October 24, 2000

*Marisa Koseyayothin*

.....  
Mrs. Marisa Koseyayothin  
Candidate

*R. Supapong*

.....  
Assoc Prof. Rachanont Supapongpichate, Ph.D.  
Chairman

*Pattaraboon Pichayapaibul*

.....  
Lect. Pattaraboon Pichayapaibul, Ed.D.  
Member

*K. Somtrakul*

.....  
Kla Somtrakul, Ed.D., Ph.D.  
Member

*Bunjird Khatikarn*

.....  
Prof. Bunjird Khatikarn, Ph.D.  
Member

*Kamol Sudaprasert*

.....  
Kamol Sudaprasert, Ph.D.  
Member

*Prakairat Sukumalchart*

.....  
Asst. Prof. Prakairat Sukumalchart, M.S.  
Acting Dean  
Faculty of Graduate Studies  
Mahidol University

*Suree Kanjanawong*

.....  
Assoc. Prof. Suree Kanjanawong, Ph.D.  
Dean  
Faculty of Social Sciences and Humanities  
Mahidol University

## ACKNOWLEDGMENTS

This dissertation could not have been successfully completed without the kindness of my major advisor and co-advisor. I would like to express my sincere gratitude and deep appreciation to Assoc. Professor Dr.Rachanont Supapongpichate, Dr.Kla Somtrakul and Lect. Dr. Pattaraboon Pichayapaibul ,who have given advices, checked and find fault with my research which are useful. I feels especially appreciate to Dr.Kamol Sudaprasert and Professor Dr.Bunjird Khatikarn for their generous and invaluable suggestions throughout the research works.

Many thanks go to Khun Songkoon Chantachon for sharing the hardship of data collection in the studied community, Khun Somsak Phodduang for a very responsible work of being an expert on nature farming in the field research. Special thanks Khun Songwut Sudhaat, Khun Sooksun Laosakul and Khun Leonard Charles Gibbs for their skillful edition of the manuscript.

I wish to express my gratitude to Major Sumol Maisuwan and Sub-lieutenant Supab Reangpha, the village govern military officials of Tubtim Siam 05 project village, for their co-operations and helps in many kinds, during our stay in the studied community.

Above all, I would like to express my sincere gratitude to agriculturists and the community leaders in Tubtim Siam 05 project village, Tambol Klong-Kaituan Amphore Klonghad Sakaeo Province, who intentionally participated this action research on nature farming without exhaustion.

Grateful acknowledgments are due to the Faculty of Graduate Studies, Mahidol University, for partial supporting grant to this research.

**Marisa Koseyayothin**

3937547 SHED/D : MAJOR : ENVIRONMENTAL EDUCATION ; Ed.D.  
(ENVIRONMENTAL EDUCATION)

KEY WORDS : PARTICIPATORY ACTION RESEARCH / NATURE  
FARMING / AGRICULTURAL HOUSEHOLDS IN  
THAI-CAMBODIA BORDER AREAS .

MARISA KOSEYAYOTHIN ; PARTICIPATORY ACTION RESEARCH  
ON NATURE FARMING FOR AGRICULTURAL HOUSEHOLDS IN THAI-  
CAMBODIA BORDER AREAS. THESIS ADVISORS ; RACHANONT  
SUPAPONGPICHATE, Ph.D., KLA SOMTRAKUL ,Ed.D., PATTARABOON  
PICHAYAPAIBUL, Ed.D., 266 P. ISBN 974-664-903-5

The objectives of this research were to study the achievement of the agricultural household heads' learning of nature farming through participatory action research; and to study and compare economic social and environmental changes in the above-mentioned households, before and after undertaking participatory action research. The samples of this study were 30 agricultural household heads in Tubtim Siam 05 Project Village Tambol Klong-Khaituan Amphore Klonghad, Sakaeo province, selected by purposive sampling, with consideration of their willingness to participate in the nature farming activities. Research instruments were indepth interview questionnaire, participant and non-participant observations, focus groups discussions, conferences, portfolios and testing knowledge. Percentage, mean, standard deviation, mode and t-test were employed for data analysis.

Results revealed that after undertaking participatory action research, the achievements of the samples' learning in nature farming were increased significantly at the level of 0.01. The sampled agriculturists showed an improvement in social, economic and environmental factors. Agriculturists decreased the use of toxic substances, using the herbs instead to protect and get rid of pests, using the natural fertilizers instead of chemicals, using the residual materials for making natural fertilizers. The participatory action research process found that the practices of nature farming were still continuing long after the study. The target agriculturists were continually planting vegetables, expanding their agricultural areas to do nature farming and increasing the kinds of vegetables. Military authorities have recognized the importance of nature farming by providing public land of 10 rai for planting vegetables.

This research concluded that participatory action research was an appropriate means for environmental education for the learning of nature farming, which would result in sustainable agricultural development. Therefore, it is recommended that action research should be employed in the process of environmental education aimed at achieving learning and practical skills' development, thus contributing to development of economic, social, and environmental conditions. Emphasis also should be placed on the underprivileged groups, small communities, as well as the needs for the communities to become self-sufficient.

3937547 SHED/ D : สาขาวิชา : สิ่งแวดล้อมศึกษา : ศษ.ด. (สิ่งแวดล้อมศึกษา)

มาริสสา โกเศชโยธิน : การวิจัยปฏิบัติการแบบมีส่วนร่วมด้านเกษตรธรรมชาติสำหรับครัวเรือนเกษตรกรบริเวณชายแดนไทย-กัมพูชา ( PARTICIPATORY ACTION RESEARCH ON NATURE FARMING FOR AGRICULTURAL HOUSEHOLDS IN THAI-CAMBODIA BORDER AREAS ) คณะกรรมการควบคุมวิทยานิพนธ์ : รัชชานนท์ สุภพงศ์พิเชฐ . พบ.ด., กล้า สมตระกูล .Ed.D., Ph.D., ภัทรบูรณ์ พิษณุไพบูลย์ .Ed.D. 266 หน้า. ISBN 974-664-903-5

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อศึกษาสัมฤทธิ์ผลการเรียนรู้และทักษะในการปฏิบัติด้านเกษตรธรรมชาติผ่านกระบวนการวิจัยปฏิบัติการแบบมีส่วนร่วม รวมทั้งเพื่อศึกษาเปรียบเทียบการเปลี่ยนแปลงทางเศรษฐกิจ สังคม และสภาพแวดล้อมของครัวเรือนเกษตรกร ก่อนและหลังทำการวิจัยปฏิบัติการแบบมีส่วนร่วม โดยทำการศึกษาจากกลุ่มตัวอย่างเกษตรกรจำนวน 30 ครัวเรือน ในหมู่บ้านโครงการทับทิมสยาม 05 ตำบลคลองไถ่เดือน อำเภอลองหาด จังหวัดสระแก้ว เครื่องมือที่ใช้ได้แก่ การสัมภาษณ์แนวลึก การสังเกตแบบมีส่วนร่วม และการสังเกตแบบไม่มีส่วนร่วม การประชุมเสวนา การสนทนากลุ่ม แฟ้มสะสมงาน แบบทดสอบความรู้ และแบบสอบถาม สถิติที่ใช้ได้แก่ ร้อยละ ค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐาน ฐานนิยม และการทดสอบค่า t

ผลการวิจัยพบว่า ภายหลังจากกระบวนการวิจัยปฏิบัติการแบบมีส่วนร่วม เกษตรกรมีสัมฤทธิ์ผลการเรียนรู้และทักษะในการปฏิบัติด้านเกษตรธรรมชาติเพิ่มมากขึ้นอย่างมีนัยสำคัญทางสถิติที่ระดับ 0.01 ครัวเรือนเกษตรกรมีแนวโน้มการเปลี่ยนแปลงทางเศรษฐกิจ สังคม และสิ่งแวดล้อมในเชิงบวก มีการลดการใช้สารเคมีเกษตร โดยหันมาใช้สมุนไพรในการกำจัดศัตรูพืช และมีการใช้ปุ๋ยหมักแทนปุ๋ยเคมี มีการใช้วัสดุธรรมชาติเพื่อทำปุ๋ยหมักเพิ่มมากขึ้น ภายหลังจากสิ้นสุดกระบวนการวิจัยปฏิบัติการแบบมีส่วนร่วมพบว่า ยังมีความต่อเนื่องของการดำเนินการทั้งในระดับผู้ปฏิบัติและผู้เกี่ยวข้อง โดยเกษตรกรได้มีการดำเนินการปลูกผักอย่างต่อเนื่อง มีการขยายพื้นที่การปลูกผักเกษตรธรรมชาติและเพิ่มชนิดผักที่ปลูก มีการรวมกลุ่มเพื่อทำปุ๋ยหมักใช้และจำหน่ายหน่วยทหารให้ความสำคัญกับการปลูกผักเกษตรธรรมชาติโดยได้จัดสรรที่ดินสาธารณะจำนวน 10 ไร่ เพื่อให้เกษตรกรเข้าทำการปลูกผักต่อไป

ผลสรุปที่ได้จากการวิจัยทำให้ได้ข้อค้นพบว่า กระบวนการวิจัยปฏิบัติการแบบมีส่วนร่วม มีความเหมาะสมที่จะใช้ในการทำให้เกิดการเรียนรู้เรื่องเกษตรธรรมชาติซึ่งเป็นแนวทางเกษตรกรรมแบบยั่งยืน และเป็นส่วนหนึ่งของสิ่งแวดล้อมศึกษา จึงเสนอแนะว่า ควรนำวิธีการวิจัยปฏิบัติการแบบมีส่วนร่วมไปใช้ในกระบวนการพัฒนาสิ่งแวดล้อมศึกษาด้านอื่น ๆ ที่มีวัตถุประสงค์การวิจัยเพื่อให้เกิดสัมฤทธิ์ผลการเรียนรู้และเกิดทักษะในการปฏิบัติ รวมทั้งเกิดพัฒนาการทางด้านเศรษฐกิจ สังคม และสิ่งแวดล้อม โดยเน้นกลุ่มที่ขาดโอกาสและควรพัฒนาจากกลุ่มหรือชุมชนขนาดเล็ก นอกจากนี้ควรคำนึงถึงความสอดคล้องกับภูมิปัญญาชาวบ้าน ปัญหาของชุมชน และควรมีความต่อเนื่อง เพื่อให้ชุมชนสามารถพึ่งตนเองได้อย่างยั่งยืน

# CONTENTS

	<b>Page</b>
<b>ACKNOWLEDGEMENTS</b>	iii
<b>ABSTRACT</b>	iv
<b>LIST OF TABLES</b>	x
<b>LIST OF FIGURES</b>	xii
<b>LIST OF PICTURES</b>	xiii
<b>CHAPTER</b>	
<b>1 INTRODUCTION</b>	<b>1</b>
1.1 Background of the Study	1
1.2 Study Objectives	10
1.3 Scope of the Studies	11
1.4 Expected Outcomes and Benefit	11
1.5 Definitions of Terms	12
<b>II LITERATURE REVIEW</b>	<b>14</b>
2.1 Related Conceptual and Theoretical Aspects	14
2.1.1 Participatory Action Research	14
2.1.2 The Concept of Constructivism	26
2.1.3 Innovation Acceptance	27
2.2 The Principle of Sustainable Agriculture	40
2.2.1 Sustainable Agriculture	40
2.2.2 MOA Nature Farming	52

## CONTENTS (Cont.)

<b>CHAPTER</b>		<b>Page</b>
<b>II (cont.)</b>	2.3 Relevant Researches	66
	2.3.1 Participatory Action Research	66
	2.3.2 Researches Relevant to the Innovation Acceptance	70
	2.3.3 Researches Relevant to Nature Farming	72
<b>III</b>	<b>RESEARCH METHODOLOGY</b>	75
	3.1 The Framework of Study	75
	3.2 Population and Samples	75
	3.3 Research Instruments	79
	3.3.1 Pre-Research Phase	79
	3.3.2 Research Phase	81
	3.3.3 Post- Research Phase	86
	3.4 Data Gathering	87
	3.5 Data Analysis	87
	3.5.1 Qualitative Data	87
	3.5.2 Quantitative Data	88
<b>IV</b>	<b>RESULTS</b>	89
	4.1 Pre-Research Phase	89
	4.1.1 Cooperating with the Leader Community	89
	4.1.2 General Background of Studied Communities	92
	4.1.3 General Data of Studied Agricultural Households	106
	4.1.4 Agricultural's Attitude towards Vegetables - Consumption	121

## CONTENTS (Cont.)

<b>CHAPTER</b>	<b>Page</b>
<b>IV (cont.)</b> 4.2 Research Phase	127
4.2.1 Group Vision Settlement	127
4.2.2 Task Assignment	133
4.2.3 Job Description	134
4.2.4 Goal Achievement	137
4.2.5 Strategic Planning	139
4.2.6 Implementation	139
4.3 Post-Research Phase	187
4.3.1 Achievement in Learning Nature Farming	187
4.3.2 Future Trend of Nature Farming	187
<b>V    DISCUSSION</b>	190
5.1 Findings on Participatory Action Research	190
5.2 Observations to Apply PAR Method to - Development in other Areas	195
<b>VI   CONCLUSIONS AND RECOMMENDATIONS</b>	202
6.1 Conclusions	202
6.1.1 Pre-Research Phase	203
6.1.2 Research Phase	206
6.1.3 Post-Research Phase	213
6.1.4 Knowledge of The Farmers Participated in PAR	214
6.1.5 Skill of The Farmers Participated in PAR	214

**CONTENTS(Cont.)**

<b>CHAPTER</b>	<b>Page</b>
<b>VI (cont.)</b>	
6.1.6 Changes on Economic of Farmers Participated in PAR	215
6.1.7 Changes on Society of Farmers Participated in PAR	217
6.1.8 Environmental Changes of Farmers Participated in PAR	218
6.2 Recommendations from the Research	220
6.3 Recommendations for further Research Studies	221
<b>BIBLIOGRAPHY</b>	223
<b>APPENDIX</b>	235
APPENDIX A Questionnaire for Asking General Data of Participated - Farmers in Participatory Action Research	235
APPENDIX B Pre - Post test for Testing Farming's Knowledge - Before and After Participated in PAR	245
APPENDIX C Questionnaire for Asking Attitude and Need of Farmers' Participated in PAR	249
<b>BIOGRAPHY</b>	252

## LIST OF TABLES

<b>Table</b>		<b>Page</b>
1	The Comparative between Natural Fertilizer and Chemical Fertilizer	61
2	Number of Villages and Households Settle in the-Self-Protection Villages along Thai-Cambodia Border Ares-Sakaeo Province	77
3	Social Group in Tubtim-siam 05 project village	100
4	Kind of Crop Products and Price Sold between 1998-1999	101
5	The Period of Farming Occupation in the Tubtim-siam 05 Project Village	103
6	Number and Percentage of Experimental Farmer Group Devided by Sex, Age, Education Level and Family Status	108
7	Number and Percentage of Farmers in the Project Classified by Occupation and Income	110
8	Number and Percentage of Sample Group Relating to Vegetable Growing Experience	112
9	Number and Percentage of the Studied Farmers Classified by Methods of Sales	114
10	Number and Percentage of Farmers Classified by the Member of Group in Community	115
11	Number and Percentage of Farmers Classified by Cooperation in Local Development	117

## LIST OF TABLES (Cont.)

<b>Table</b>	<b>Page</b>
12 Number and Percentage of Farmers Classified by Sufficient Water Resources	119
13 Number and Percentage of Studied Farmer Group Classified by the use of Chemicals in Farming	120
14 Number and Percentage of Studied Farmers Classified by Method of Natural Material use for Soil Improvement	122
15 Attitudes Towards Nature Farming Methods in the Participatory-Action Research	124
16 Group Vision Settlement of Participants in the Participatory-Action Research	131
17 Implementation Plan for Growing by Nature Farming Method	140
18 Objectives and Types of Assignments Gathered in Portfolio	157
19 Expenses and Cost to Perform the Nature Farming in the Project	165
20 Problem,Obstacles and Solutions to Cropping System in Nature Farming Performed During the PAR	167
21 Results of Practices in Nature Farming by Farmers Joining PAR	182
22 Comparative Achievement between pre-PAR and post-PAR in Learning Nature Farming	187

## LIST OF FIGURES

<b>Figure</b>		<b>Page</b>
1	The Relation between Researcher,Local people and Local Development Institution Participatory Action Research	18
2	Planing Circle for Participatory Action Research	22
3	Teamwork Development Circuit	22
4	Integrated Cycle of Participatory Action Research	23
5	The Process of Wisdom depended on Constructivism Theory	28
6	The Framework of Participatory Action Research - on Nature Farming	76
7	The Map of Thai-Cambodia Border Areas	91
8	The Tubtim-siam 05 Project Village,Tambol Klongkaituan , Amphore Klonghad Sakaeo Province	95
9	Distribution of Farmers'household in Participatory Action Research Project	97
10	Use of Process of Participatory Action Research for Sustainable Agriculture Development in Border Community	201

## LIST OF PICTURES

<b>Picture</b>	<b>Page</b>
1 The Military Official of Tubtim-Siam 05 Project Village Protected Security for People in the Village	93
2 The Office of Village Military in Tubtim-Siam 05 Project Village, Tambol KlongKaituan Amphore Klonghad ,Sakaeo Province	93
3 The Deciduous Forest along Thai-Cambodia Border Areas - Encroached by People for Growing Farm	96
4 Natural Materials in Community that Farmers never used for Soil Improvement	96
5 The Area Condition before the Performance	169
6 Water sources in the Village	170
7 Reservoir that Farmers used for Agricultural on their Farmland	170
8 Tour Investigation at Suranakhon Central Market	171
9 Focus Group with Communal Leader and Relevant Stakeholders	171
10 Cropping Areas that Owned by Some Participated Farmers	172
11 Participation of Farmers on Applying Compost Manure	172
12 The Participation on Seed Distribution of Farmers	173
13 Academics Contributed Knowledge on Nature Farming by Focus Group Discussion	173
14 Bed Preparation by Farmers was the Starter Point of Environmental Development in the Community	174
15 Seedling in One Farmers' Bed Grew well without any Problems	174

## LIST OF PICTURES(Cont.)

<b>Picture</b>	<b>Page</b>
16 Transplantation could be Carried Out After 3 Week-Seedling under the Advice of Academics	175
17 Nourishing Grown Vegetable by Picking Pest Out from Seedling	175
18 During the Seedling Preparation. It was Found That Some Farmers Faced the Problems About <i>phyllostera chontanica</i>	176
19 The Problem About Snails That Some Farmers Face During Heavy Rain	176
20 Problem About Vegetable Bed Located Under the Big Tree	177
21 Vegetables Faced the Problems on Fungi and Rotten Root	177
22 Some Farmers Raised Their Cropping Beds up in order to Avoid Flooding Problem.	178
23 Harvesting Period Which Enable Farmers Receive Good Quality and Chemical Free Productivity	178
24 The Productivity could be Exchanged and Distributed Among Neighbors in the Community	179
25 Chemical Free Vegetables Deriving From Natural Agriculture were Consumed in the Household	179
26 Some Vegetables were Kept for the Further Breeding Leading to the Cost Reduction.	180
27 Some Vegetable Beds Performed by Farmers Joining in PAR Showed the Diversity in Vegetable Beds up to 10 Species.	180
28 Most Farmers have Continued the Natural Agriculture after PAR	181

# CHAPTER I

## INTRODUCTION

### 1.1 Background of the Study

Agriculture is an occupation that has long lasted with human beings since the past till now. However, in the past, performance of agricultural occupation was only for supporting their family members. Later on, there was an exchange or purchase of the things they needed within their local communities. After that, when the number of the world's population increased, the old agricultural system as well began to change and later led to the unsustainable agricultural system instead, which in an early period, only responded to the consumption need of the community population. After that, it was expanded and then turned to be the plantation of one kind of cash crop on the vast land for commerce leading to the change from the forest areas to the crop fields. This caused the loss of natural balance, as well. The propagation of some particular kinds of plant has occurred due to the abundant fertility much more than the normal rate (Vitoon Lianjumroon, 1996 : 20)

The change of the purpose as mentioned above, has been the starting point of unsustainable agriculture. This is because human beings always try to overcome the problems. They use both scientific and technological way to control the living things dangerous to their crops by using chemicals, as well as chemical fertilizer to improve the soil and plants so that they can gain a huge quantity of products. In addition, they

also use technology, such as forcesaving equipment, etc., as we call later “the new agricultural system” (Tasanee Nan-U-Don, 1996 : 10)

The new agricultural system has been obvious after the period of world war II, especially in 1960, as learnt the period of Green Revolution in the third world under the support of industrial countries and overseas agricultural corporations with inclined business purpose. It is the agricultural system based on modern technology emphasizing on high investment in terms of machinery and production factors, such as species, chemical fertilizer, and pesticide, etc, as well as emphasizing on particular expertise in plant and animal in terms of only one kind of production on the vast land. In addition, there is the use of large amount of petroleum as the raw material for agricultural machinery, and for fertilizer industry, including for chemicals, as well as the use of energy in production process and in the transportation. This is the farm of agricultural system, of which the agricultural corporations have had the influence in controlling production factors, transformation, marketing, and transportation. Besides, it is also the agricultural system, on which the government has an important role, such as price fixing identifying the kind of crop for plantation, etc, (P.F.Parlett, 1987 : 265-269)

This new agricultural system is the thing that distinguishes from the natural way, causing the impact on environment and ecological system, such as the rapid decrease of forest areas due to the need of more areas for more cash crop exportation. The expansion of agricultural areas has increased since the 1<sup>th</sup> national economic and social development plan because the government policy put the focus on economical development. The forest areas have been encroached since then, as well.

(Prathamapidok, 1996 : 23). The picture taken from satellite by the Department of Forestry in 1995 showed that forest areas left were a total of only 82,178,161 rai or 25.62 percent of the whole country areas that has decreased more than 100 million rai since the 1<sup>st</sup> national economic and social development plan. (Department of Forestry, 1997 : 2)

In addition, the new agricultural system has also sent the negative impact on natural resources : soil, water, air, living things, and plants due to the use of chemicals, pesticide, insecticide and chemical fertilizer. At last it has as well sent the impact on the health of producers and consumers (Vinai Veerawattananon, 1997 : 96) The department pollution control ministry of Science, Technology and Environment revealed that 3,165 and 41 farmers has obtained the toxic chemicals and died from the use of pesticide respectively in 1994 (Department of Pollution Control, 1994 : 42)

Regarding the impact on economy and society, the new agricultural system has weakened economy of the agricultural section in terms of per capita income. Duration the five year period between 1990-1994, it was reported that 35-36 million Thai farmers had 7,602-8,290 baht per capita income a year. Meanwhile, in the industrial section, 11 million workers of which had 87,507-119,992 baht per capita income a year. When compared the hike of the aid income between agricultural and industrial sections within 4 years, it was found that income of population in the agricultural section had increased 628 bath per head, while the income of population in the industrial section had increased 32,485 baht per head. (Wattana Muangngarm, 1999 : 4)

The lessons in the past (1<sup>th</sup> - 7<sup>th</sup> National Economic and Social Development Plan unveiled that the more the government focused on production responding to the marketing, the more the unstable economy and society became. Furthermore, this also sent the severe impact on the deterioration of surrounding environments and natural resources. These happened due to the mistake of government policy, which had weakened.. The agricultural society leading to the workforce migration problem, as well as the broken rural families and communities. Local wisdom had become rejected since it was considered out-of-date science. The ways for developing agriculture were in hands of government agricultural institutes and big scale of agricultural corporations. (Vitoon Lianjumroon, 1996 : 28-29) Even though, agricultural products had increased, as well as the growth of satisfying economy, there had been the severe problems on environments and unfair income distribution (Chanuan Rattanawaraha, 1991 : 4)

Thus, the future desirable agricultural system should be the agricultural system for lives and environments as well as for self reliance, which means decrease of reliance on external factors, no use of chemicals, but use of appropriate technology suitable to the Thai farmers' base, gaining more products sufficient to the needs of food and income, resulting in the stability of family, locality and the nation as a whole. Farmers themselves have enough income for good quality of life. In social side the family institute and Thai agricultural community should be vigorously, tied together with the happiness, and the cultural which is built from local wisdom. Farmer and consumers have good health and safty from chemical substances. In environment and natural resources should be sustained to resuscitate, and not be destroyed. Farmer

should be supported for self-reliance and finally be the stable origin of the country (Thailand Environmental Institute, 1995 : 7)

In the 8<sup>th</sup> national economic and social development plan (1997 - 2001), the government has contained a sustainable agriculture development policy such as nature farming, organic farming, mixed agricultural, and forest agricultural, for reducibly risking of income and expenses, including the recovering of environment and nature resource. (The National Economic and Social Development Board, 1996 : 80) This agricultural system has the similar principle, the main principle of which aims to put the emphasis on the importance of ecological system. A sustainable agriculture system have many types, of nature farming in terms of MOA is one of the pattern.

Nature farming of MOA has originated from Japan, by Mr.Mokichi Okada who built Nature agricultural Research Center and Nature agricultural University in 1990 in Japan.

Nature farming of MOA system was giving emphasis to the utmost utilization of soil potential, as well as to the preservation of natural balance and harmony. MOA nature farming products will be free of toxic substances, preserved the environment, without hazard to all human beings' health in currency and in the future, which has been successful and progressive in Japan. Farmers can live with good quality of life, and with sufficient incomes, as well.

Basic principles of MOA nature farming are as follows :

1. The products form MOA nature farming will be free of toxic substances with good quality, focus on the importance of soil.

2. MOA nature farming is the way to use the full efforts in improving each locality as its necessity, and in preserving and improving soil potential , as well.

3. Chemical fertilizers will be banned, including other controlling chemicals for expediting the growth of both plants and animals.

4. Excrement from human beings will be banned, as well.

Sakaeo Vocational Training and Development Center for Thai people along the border areas attached to Non-formal Education Department, Ministry of Education, was supported from Mokichi Okada Association International by training, making a tour of inspection in Japan, and sending the nature farming experts from Japan to advise the authorities until getting skillful and technique pattern of MOA that suited the eastern of Thailand. Sakaeo province, which have many sickness from pesticide. In 1996, Ministry of public health had reported that Sakaeo had the sickness from pesticide 1 in 10 of Thailand (Department of Pollution Control, 1996; 22)

However, the dissemination of knowledge on MOA nature farming to the farmers living have many problems, such as the dangerous and difficult working in sensitive areas, the dangers from the fighting in the neighboring country. A civil war in Cambodia was effective to people and soldiers fleeing across the border along Sakaeo province, the starving people were effected by plunder, especially the people who were fully armed. In addition to, some of the border parts in agricultural areas were used to lay down mines for protection from invading opponents. The border was in contact with Cambodia from the North of Tapraya district to the south of Klonghad district had along 165 kilometers.

Besides, the physical of Sakaeo border was a geometrical plane. No mountain, no river or sea to put up a protective border like the others. There was only a ground canal which was dug to prevent the tanks from crossing. These factors initiated the negative impact of Thai border development, such as degenerating resource, the ground was not nurtured, the forest was destroyed, the people felt that they were not protected to earn a living in these areas, the people did not love their native place, they always migrated depending on the situation. There are many genealogical people along the border which are difference in culture and value. Although agriculture is a main occupation of the people along the border, but they lacked the motivative production, especially most of the youths turned down agriculture occupation, thinking that it was a humble, outmoded and poor occupation.

In all of the agriculture production of farmer along Sakaeo border except the farm crops and rice, there are the main produce which farmer like to plant, it is truck crops. (Sakaeo Provincial Official, 1996 : 71) The marketing is a high requirement as well as in the center and provincial, they can easy sell to get a good price. At the present time, the consumers like to consume the truck crops but are lacking the "guarantee" about the toxic substances in the truck crops. There are no ways for them to select, although they know the dangers, because the truck crops free of toxic substances are not wide spread obtainable in the market and the farmer receives the toxic from chemical agriculture.

Therefore, dissemination of knowledge on nature farming to the farmers for them to understand and getting skills on nature farming are the path way and data for them to decide. This is one method to sustain agriculture that did not destroy the

environment, producer and consumer, besides can keep the quality resource for the next generation. The procedure drawn up by farmer for prating on nature farming were not easy, because they were detained on the agriculture pattern which depended on chemical substances and chemical fertilizer for along time. Therefore, the education management must consider the main factor which supported the farmer learning. Warakorn Sukdhamaraksa (1994 : 76) has studied the social and economic factor give effect to concede the using margosa chisel sustances controlling the insect enemy plant of the farmer in Rachaburi province. The conclusion of studying are as follows :-

1. The place for education management should be the lodging of farmer, because they must earn a living in the farm.
2. The knowledge will be in teaching what the farmer wants to know.
3. The procedure giving education must be special is that suitable for special local areas.
4. The season for education management must be suitable, such as in the season that farmer were exhausted from the main task in the farm.
5. The content to teach must be a new way or new changing ways which concentrate on increasing the production.
6. Information or the new procedure to teach must be the efficiency technology and gibing the high economic production.
7. Must be to activate the farmers who are brave and have the will power to try out the new thing that have been taught to them.

The results of studying was consistent with the study of concede innovation in agriculture of Vittaya Dhamrongkiatisak (1986 : 53) remarked that farmer will be concede the innovation, which change their belief, Use, and the procedure in the former time must be practice by themselves.

So, the academics, educators, and developers believed that the best instrument used for the people learning is letting them learn by doing nature farming in the real situation. So, Participatory action research can help promote farmers' learning. This is because the research process will be carried out by exchanging experiences and opinions among communities, researchers and developers. The communities gradually develop the capabilities in learning and solving community problems by themselves. The data getting was reflected in the opinions, the need and the pattern of way of life of communities. In addition participatory action research is as well the process helping promote democracy by making them know how to work to gether, including skills and including skills and agility in community management in order to develop their own communities. Furthermore, it will be as well the instrument promoting their participation in solving problems and learning together. (Kamol Sudaprasert 1997 : 6)

The philosophy of Participatory Action Research is bound to help the decreasing opportunities for people in the communities. Believing in the human capabilities to try to find the procedure in solving the problems when they want to decide, and believed that the education should help people to be convinced that they can help themselves. Education should help educate information top to the people. The ultimate goal of participatory action research is helping the people getting their purpose and promoting their self development. Besides, participatory action research

strengthen communities, be able and responsible in solving community problems leading to the self-reliance and driving the continuing activities when the researcher withdrawal from the communities. (Non-Formal Education department, 1995 : 12)

Regarding the participatory action research benefits as mentioned, the researcher, therefore, is interested in using participatory action research to help developing knowledge on nature farming of the underprivileged agricultural household along Thai-Cambodian border areas. The consequence is that the farmers will have knowledge, skill and awareness on nature farming as a way to help developing sustainable agriculture, resulting in local economic, social and environmental development, as well. The most important thing is that Participatory action research can help extract the highest competency from human beings used for their own self and community development.

## **1.2 Study Objectives.**

The objectives of this research were as follows :-

1.2.1 To study the achievement of farmers' learning nature farming through Participatory Action Research selected from the agricultural households along Thai-Cambodia border areas.

1.2.2 To study and compare economic social and environmental appearances of the above-mentioned households before and after undertaking participatory action research.

### **1.3 Scope of the study**

Because of Thai-Cambodia border areas in the east has adjoined along area with Cambodia through 798 kilometers. Effecting spread many of agricultural households along Thai-Cambodian border areas. Therefore, this research is limited by studying special special agricultural households along Thai-Cambodian border areas in Sakaeo province which have 3 districts namely Tapraya, Aranprated and klonghad. The studying of MOA nature farming will study specially on agricultural households who have planted vegetable only, did not include to perennials, rice, livestock and another agricultural. Because of the restrict of time and the suitable areas so this research have emphasized the agriculturist learning from participatory action research process.

### **1.4 Expected Outcomes and Benefits**

After the conduct of this research, it is knowing the procedure activities of occupation development through participatory action research. Researcher is expect that nature farming can apply into doing other kinds of agriculture. This also will help generate new alternatives used for developing agricultural occupation, did not destroy environment and ecology system, leading to the development of sustainable agriculture, economy, society, environment and agricultural households along Thai-Cambodia border areas have got the idea to develop the agricultural business in community. Community organizations will become stronger due to the stable occupation, increased income from selling vegetable product, decreased expenses, better quality of life, self-reliance ability, and the create stability along the Thai-

Cambodia border areas. Furthermore, the outcomes of the research can be applied into adjusting policy for the government service which related rural development for adjusting the development process to be more consistent for the people along the border in the future.

### **1.5 Definitions of Terms**

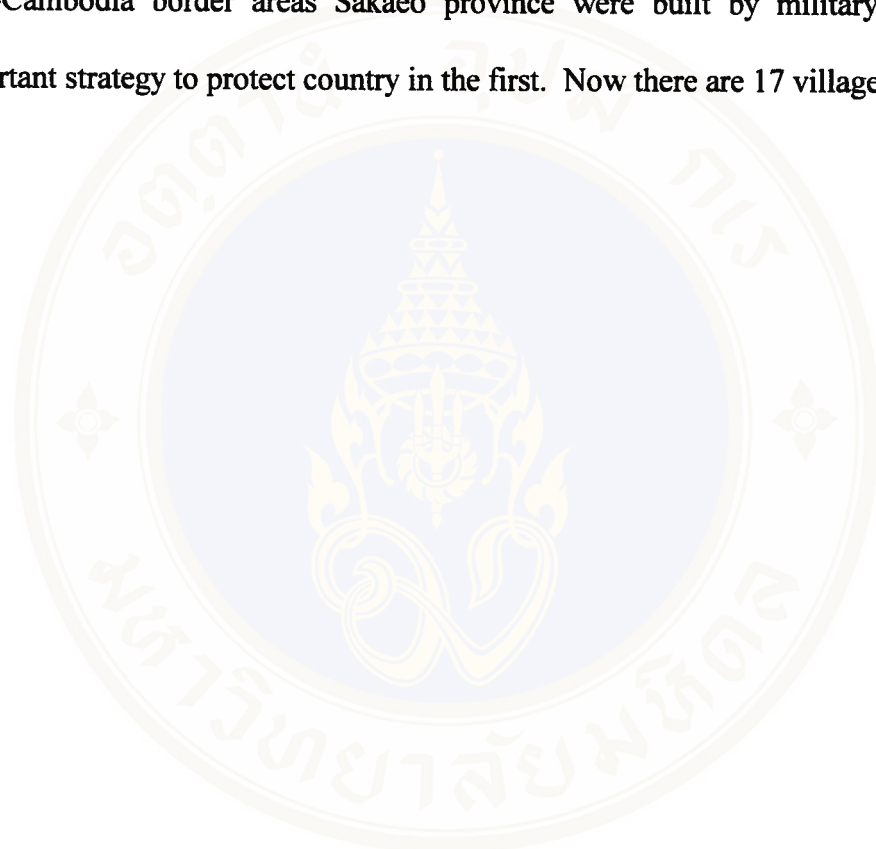
**Participatory Action Research** means the process working together for studying agricultural occupation development on nature farming. The product of the research will be stable develop nature farming occupation in the community. The team of researchers were composed with 3 persons, such as villager section namely agriculturist and community leader, the authorities development section namely agricultural academic from Sakaeo Vocational Training and Development Center, military, and authorities with related in the areas, and the researcher section. The process of Participatory action research comprises brain storming analysis of community problems by focus groups for exchanging ideas, group gathering on nature farming, and evaluation gathering for stable agricultural development.

**Agricultural Households along Thai-Cambodia Border Areas** means agricultural family whose have agricultural family whose have agriculture occupation on planting vegetable in along Thai-Cambodian border areas Sakeao province.

**Nature Farming** means the planting vegetable by using the MOA nature farming which have antibiotic for disease and insect, free of toxic substances, focusing on the importance of soil by changing soil structure and increasing organic material in the soil by using manure and using of herbs to protect and get rid of the pests of the

agricultural households. This procedure of agriculture, Sakaeo Vocational Training and Development Center have tried in the areas and adjusted for successful, especially in vegetable planting.

**Self Protection Village in the Border Areas** means the villages along Thai-Cambodia border areas Sakaeo province were built by military which have important strategy to protect country in the first. Now there are 17 villages.



## **CHAPTER II**

### **LITERATURE REVIEW**

Major contents of this chapter are the bounding of conceptual framework, theory and related literature concerning this study. The contents are divided into 3 parts: the first part refers to conceptual frameworks related to this study which are Participatory Action Research (PAR), Constructivism Theory and Theory of Innovation Acceptance. The second part is the principles of sustainable agriculture that is presented in various patterns of sustainable agriculture and MOA nature farming which is mainly applied in this research. The last part refers to other related research literature.

#### **2.1 Related Conceptual Framework and Theoretical Aspect**

##### **2.1.1 Participatory Action Research**

Participatory Action Research is a research and development (R&D) emphasizing on the change on the development of targeted organization, institution and community. The goal is to enhance individual potentiality and encourage each individual to participate in the development of their own organization, institution and community. PAR is designed for social development. Previously the concepts of national and social development largely focused on economics development rather than social, politics, academic or human resources development. Hence, the undergoing social development can not reach the anticipated goal and many unexpected problems have raised. Other striking effects from such development are

the increasing of less-opportunity groups in society. In spite of much effort from government and non-government organization (NGO) to help this less-opportunity groups, it is not satisfactory accomplished. In addition, other development projects on social, economics and education development have faced the same problems. As a result, a group of academics and developer have searched for a way to better the lives of less-opportunity in society. It is found that PAR is an effective method. At the same time, WHO and World Bank also promoted and encouraged community participation particularly in Community Education Participation (CEP). A distinct aspect of this research is that information from every step of the research is recognized and exploited by community. Community defines its own problems and finds out the solutions. Community is the one who determines and insists on the resolution to solve such problems. The research is executed in forms of exchanging experiences, and ideas between community and researcher. The exchange of idea is a dialectical synthesizing method. Community will then gradually enhance their capabilities to solve community problem and manipulate self-learning. Information from such researches will be specific and reflects community's ideas, needs and norms. (Sudaprasert Kamol,1997: 8-9)

Participatory Action Research is a result of new development concepts aiming to adjust and improve undergoing development patterns, research methodologies and development projects from government. Those developments were done by top-down approach or centralize on government, developer or researcher. However, PAR has turned a development concept to be bottom-up approach where

people in the community are the center of development patterns. Philosophy, concepts, goal and methodology of Participatory Action Research is as follows:

### **Philosophy of Participatory Action Research**

The philosophy of Participatory Action Research emphasizes to help less-opportunity group in society believe in human capacity to solve their own problems when they have to make a decision. Education should encourage the confidence of people that they can achieve something for themselves. Education should support the learning which is most beneficial to people. The highest goal of PAR is to help community set their own goal and to support the goal for individual development.

### **Concept of Participatory Action Research**

PAR is a methodology consisting of two key words: participation and action. This research applies 2 concepts of research methodology, which is participatory research and action research. (Department of Non-Formal Education, 1995 : 8-24)

For alternative developer, participation means that people members in community, researcher and staffs have exchanged ideas and assessed community needs. Together they analyze current situation and point out problems and weakness of community, and then find out the solution for such problems. Various of community resources are investigated, ranging from natural resources, human resources both inside and outside community which are organizations and institutions in that area. Problem solving, action plan, follow up, and evaluation process are accomplished by all parties especially the members in that community who have joined the entire process. Principle concepts of PAR is as follows:

(1) PAR is a dynamic and living process, in other words, it is not static. The research is executed in real situation and searches for the problems and the origin of such problem in society. Is it from economics situation, society, politics, culture or belief. Then this research will move towards the possible end in the future, though it is not predictable. As a result, PAR must have a distinct characteristics which are:

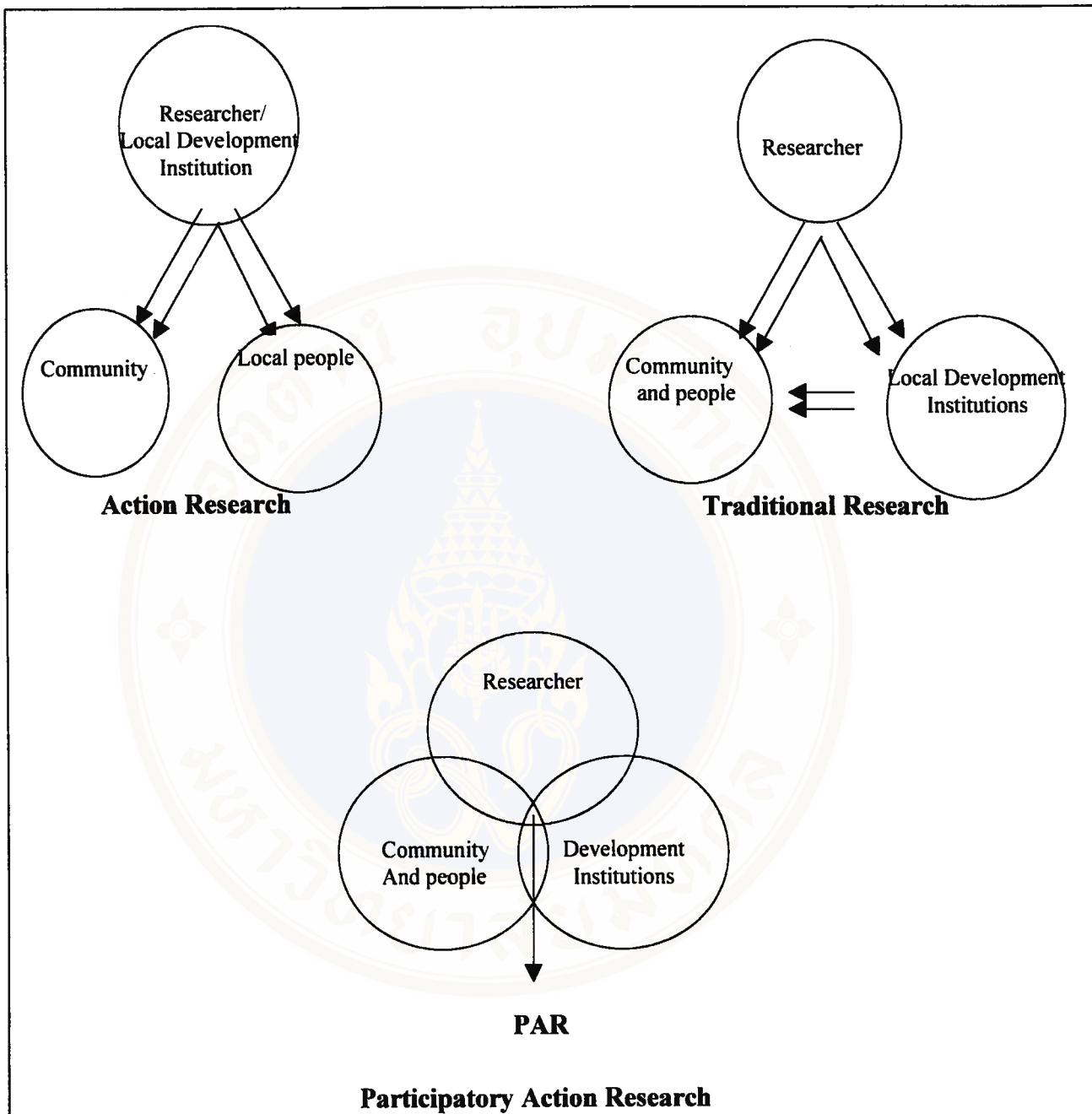
- Flexible and adjustable
- Unfixed timing
- Unfixed activities ( particularly for problem solving)

(2) PAR will be successful if researchers and involving entities believe that

- Everybody has the ability to think and works in teamwork in order to better the quality of life.
- Indigenous knowledge is equally important as knowledge of researcher, academics or developer.
- Everything in community- knowledge, skills, existing and potential resources must be equally distributed.

(1) PAR must be originated from personal conception on community problems and needs. PAR then will leads to a better understanding and action that will provoke a change on oneself, and community in intellectual, mind and physical aspects.

(2) PAR is a continuous process and will not end in only one cycle. It would rather leads to a new cycle full of knowledge searching and action. This cycle will exist and continue as long as local people and community members can hold on together.



**Figure 1** The Relation Between Researchers, Local People and Local Development Institution. Participatory Action Research  
Adapted from Department of Non-Formal Education (1996 :9)

(3) Impacts of PAR on community and researcher are as follows:

- Local people and less-opportunity groups will be more educated so that they can figure out and analyze the situation more precisely. They will be confident to participate in economics, social and politics activity that will be beneficial to themselves and community. In addition, self-reliance and sustainable development is bringing about.

- Major problems in community will be solved. Less opportunities group will be given more chance. Resources and benefits will be allocated thoroughly and fair. Knowledge and information is a mean to a better living quality in community.

- Research and developer will learn from community and gain experience from working with community, leading to a better understanding on community and accomplish a genuine development.

-Researchers will accomplish their ideal development.

**The objectives of Participatory Action Research**

The goal of PAR is to give more chance to less- opportunity group to learn so that they can develop themselves. This will lead to a development in community and society. Quality of living will be better. Thus, the objectives of PAR is as follows:

(1) Stimulate the consciousness of less-opportunity groups to recognize their own problems and make them realize their responsibilities to solve their own problem and community.

(2) Execute the research emphasizing on data collection and analysis with scientific approach. The data will help in decision-making process, defining problem,

finding solution and problem-solving. This process will be accomplished by community, may be with the cooperation by organization and institutions in charge.

(3) Join with community to carry out socio-economical and political activities.

(4) Encourage group forming as well as teamwork in problem- solving, and community development. All activities must be run continuously.

### **Participatory Action Research Methodology**

Participatory Action Research does not only aim to find out the answer to establish a concept, theory or problem-solving planning, but it is also a development on individual and community involving with studying process for personal potential development. As a consequence, PAR must consists of the following methodologies:

(1) It is adult education and group forming. PAR relates to adult education in terms of encouraging people to think, to be confident and decisive. This kind of personal development is an education process but the teaching strategy is not like teacher and students. An effective strategy is to get close to people and have them express their genuine ideas and feeling and then develop skills needed in team working as well as problem solving. As a result, grouping process and group forming is a key for the success of PAR.

(2) Apply qualitative research (Participatory Research) which aims to find facts together with people in the process of data collection and analysis.

(3) Apply actin research, in which community members must solve their own problem by action plan and expedient problem solving.

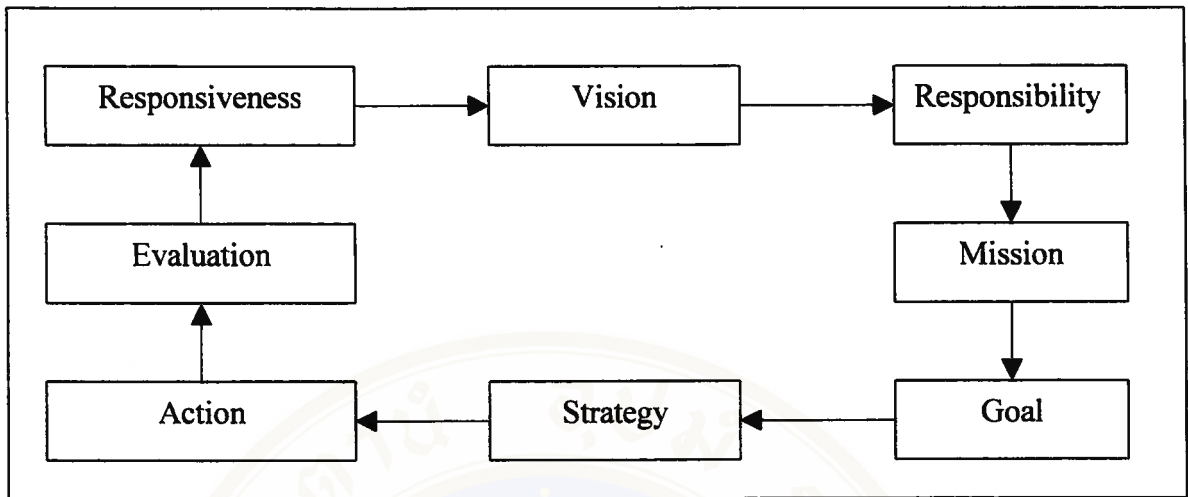
(4) Apply problem-solving methodologies in every process, ranging from identifying problem, analyzing problem, presenting situation, defining and selecting the problem as well as choosing the problem-solving strategy. In all steps of problem-solving process, community will think to solve problems by their own but will apply information and principles suggested by researchers.

### **Cycle of Participatory Action Research**

To stimulate a sense of mutual holding is a key the process of PAR. After all activities are finished and researcher have moved out of the community, people will still feel bound to activities they have done and these activities will be continued. This is a basis for sustainable development. PAR is a process in which 3 principal entities- people (in this study refers to farmers and community leader), academics or developer, and researchers- will work in team work. Dr. Sudaprasert Kamol, a significant academics who is interested in this issue, has translated and presented “An Integrated Model of Planning and Team Development for Knowledge Based Organization (Bureau of human resources development project coordination,1998 : 79-87. This model can be applied as a specific framework for PAR. PAR can be separated into 3 related circuits:

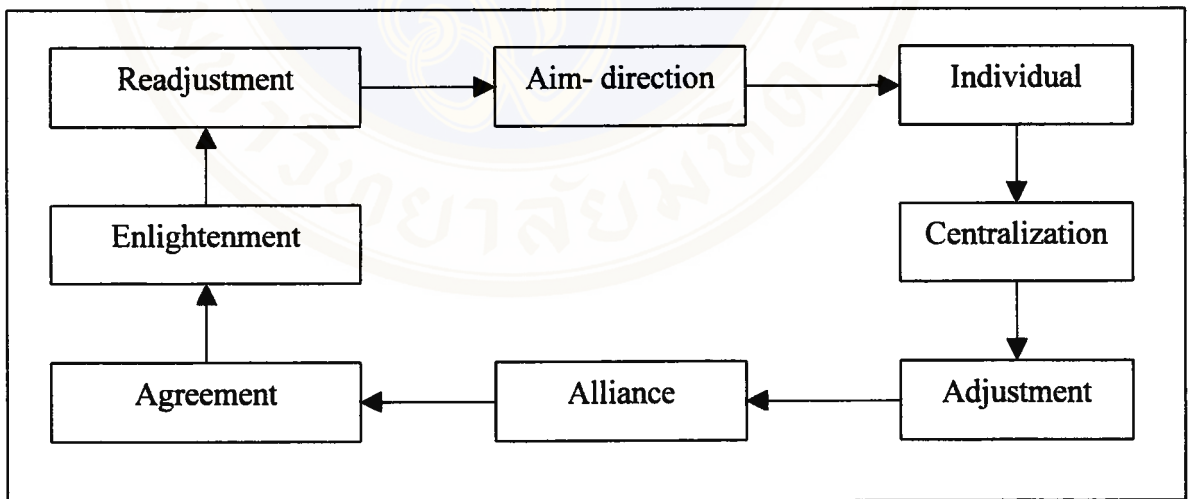
1.Planning circuit consisting of significant process as follows: cooperation in determining vision, responsibilities, main mission, goal, strategy, action, evaluation, responsiveness. This circuit will be shown in Figure 2.

2. Teamwork development circuit is a process to develop teamwork in order to accomplish the planning. It starts from aim and direction towards the point



**Figure 2** Planning Circle of Participatory Action Research

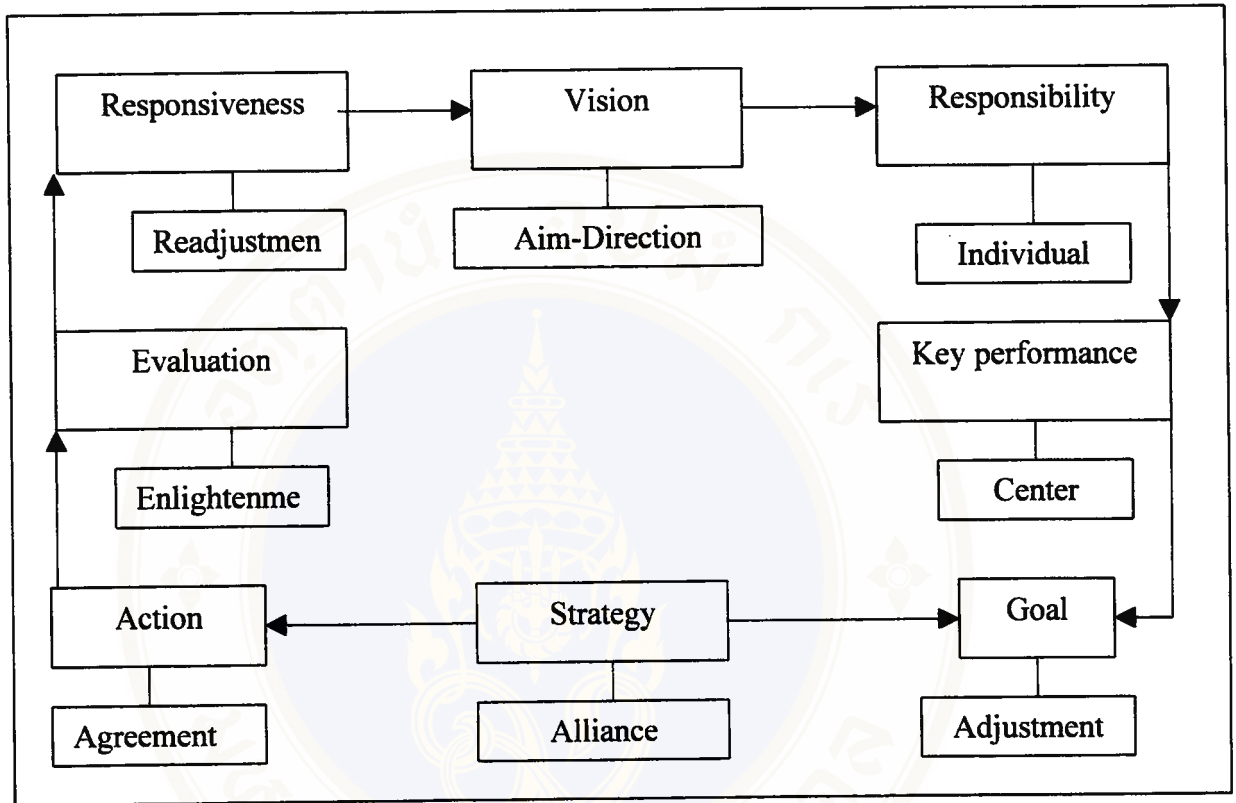
where all entities are alliance and have reached an agreement, enlightenment and readjustment as in Figure 3.



**Figure 3** Teamwork Development Circuit of Participatory Action Research

3. Integrated Circuit is to integrate the first and second circuit. Every step in planing process will be combined with every step in teamwork development. This integration will give and experience to a small dynamic group in safe environment.

This group will be bound to the action plan and this is a basis for an effective team work relation.



**Figure 4** Integrated Cycle of Participatory Action Research

There are 7 major steps in these 3 circuits which will be clarified as follows: (Kamol Sudaprasert, Bureau of human resources development project coordination,1998 : 84-87)

**1. Vision- Aim and Direction**

An explicit vision must present positive announcement on direction that the team wishes to accomplish in some point of time such as guideline philosophy or values. This will provide a framework for policy, decision and action.

## **2. Responsibilities : Individual**

A responsibility should declare why teamwork is required and clearly explain the main mission and value of this teamwork. Special skills and extra activities of teamwork must be specified. The responsibilities will points out the objective of teamwork and develop a uniqueness of each individual in the team. The involving beneficiaries play a major role to determine responsibilities and uniqueness. The factor for success is change from internal organization to external beneficiary. The understanding of needs, requirement and limitation of beneficiary of involving beneficiary as well as the understanding of the team towards the perception and expectation of those entities is therefore a very important factor to make a decision and determination on responsibilities and uniqueness of each individual.

## **3. Performance- Centralization**

Key Performance Area (KPA) is a critical point in the circuit which will lead to an achievement set by vision and responsibility. The best way to determine the mission is to brainstorm and find out strengths, weaknesses, opportunities and threats (SWOT)

## **4. Goal ReAdjustment**

In determining goal, the efficiency and effectiveness of work must be considered. Most of the goal should effect to beneficiary. A process leading to an agreement on goal will assist in team work readjustment. Everybody will understand the goal of the team and is able to assist to reach that goal.

### **5. Strategy – Alliance**

After determining goal, a strategy to accomplish that goal must be defined. This can be reached by establishing alliance with related group or people and brainstorm to breakdown the obstacle to accomplish that goal.

### **6. Action- Agreement**

To develop a specific action plan for each goal under the framework of strategy and alliance will point out the starting point of the plan, and point out the responsibility of each entity. All of these will help to accomplish the goal.

### **7. Evaluation**

The successful teamwork needs some responses on the transformation of both internal and external environment. Long-term goal may need strategic alteration as well as operational plan need to be developed. Developmental conference is necessary, if not, there would be some problems on the whole process.

Participatory Action Research can be adapted by dividing into 3 phases, according to the stage of the research, as follow; Pre-Research Phase, Research Phase, and Post-Research Phase. The aim of the research separation is to clarify the operational process. However, in practice, the research steps might not be simple because the research steps might emerge simultaneously. However, some steps might be done in one phase and continued in another phase or they might be returned to the beginning. ( Non-Formal Education Department, 1995: 8-24)

This research is both research and development. It is research for development and research in developmental project because researcher and developer work with the community in order to develop the community and strengthen

communal organization. The community will be able to solve the problems and responsible to its community leading to self-reliance. However, the accomplishment can not be done in the short period of time, we can not determine the specific time frame. Thus, before conducting this research, the crucial concepts of participatory action research should be referred to. These crucial concepts are problem solving emphasis, community problem oriented, and community and people development project.

### **2.1.2 The Concept of Constructivism**

There are many well-known educationists proposing the concept that support the theory of knowledge construction. The principle of this theory states that the learners must be the mover who create the knowledge, not just keep it and pass on whenever someone or some events demand it. The research on the nervous system obviously supports this concept that whenever stimulated from external factor, what are some movements on the nervous system and how the thinking system can be stimulated.

The philosophy of constructivism believes that knowledge created by human posses specific meaning for each individual. Human creates knowledge by blending external information with something they have known and then create new meaning. Piaget, an important person in the philosophy of constructivism, believed that learner's understanding would occur in the process of the stages from learner's involvement in situations, which made them understand by themselves. He believed that " the development would happen step by step and the rule which was beyond the stage of his intelligent development would not be understood" and intelligent

development would occur when there was some self adjustments to the environment. There were 2 kinds of self adjustments, assimilation and accommodation. Vygotsky L. (1896-1934), a Russian educationist, had the opinion relevant to the philosophy of constructivism. He believed that learner learnt from the conflict between the new idea and the existing idea. Hence, to create one's own concept, one needs to use the other's concepts. The result from using the other's concepts will be compared with one's existing concept in order to create new concept. (Bureau of Human Resources Development Project . 1997: 129-135)

### **The Process of Knowledge Construction**

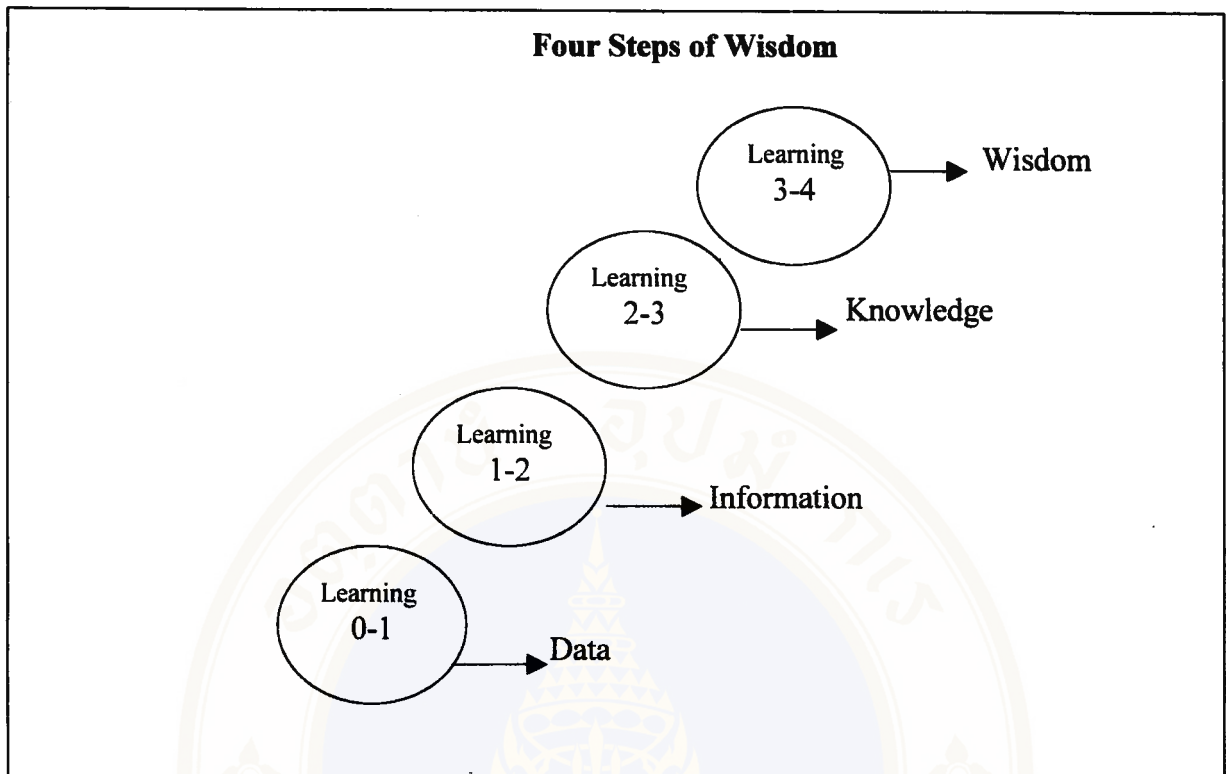
Kamol Sudaprasert (Office of Human Resources Development Project Coordination, 1997: 12) explained that the process of knowledge construction began from data collection. Human integrated all data until it became information, analyzed or categorized it, created it until it became knowledge and finally compared this knowledge with existing knowledge. Human adopted the part that was harmonious with existing knowledge, which led to intelligence or wisdom. This thinking process is endured.

### **2.1.3 Innovation Acceptance**

#### **Theory of Innovation Acceptance**

Personal acceptance is another aspect of behavioral change. Concepts from such personal change are interesting and relevant to this research are as follows;

Cartwright's theory proposed the concept that individual behavioral change consisted of 3 essential structures which were relevant to each others. (Cartwright, 1949: 253-267) These structures are cognitive structure, Motivational structure, and



**Figure 5** The Process of Wisdom of Constructionism Theory

**Sources** Bureau of Human Resources Development Project Coordination (1987: 131)

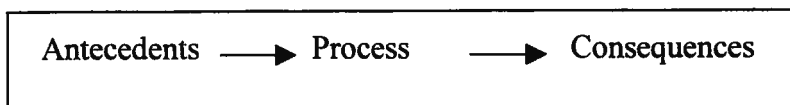
action structure. The structural change can be achieved by the specific channel, i.e. Cognitive structure can be changed by providing clear and acceptable information. Motivational structure can be altered by showing or demonstrating people some good patterns. Action Structure can be transformed by providing people opportunity to perform good things, which is easy to do and useful for them. The required behavior will occur automatically.

George M. Foster (1973: 146-147) defined acceptance as the way people learn through education, which can be described by the process of perception. Acceptance occurs when there is self learning and this self learning will be achieved

when one applies it. When one is confident that the innovation yields profits, one is dare to invest in that innovation.

Prapapen Suwan (1983: 110-111). in her work, referred to Sherif and Hovland who believed acceptance was one part that lead to person's attitude development. The scope of attitude can be divided into 3 types which are acceptance, rejection and non-commitment. Sherif and Hovland explained that in order to categorize one's opinion into any types of attitude, it depended on evaluation. To judge whether one willingly agrees with something, which means one accepts that idea, it depends on one's participation. In addition, Suwan (1983: 114), citing to Greenwald's theory of participation, said that when one received some information, one would faced 2 kinds of decision; acceptance and rejection. In order to make a decision, the linkage between new information and existing information is needed. The readiness to perform something in the decision process consists of the information evaluation.

In 1971, Roger and Shoemaker (1971: 102-103) proposed a model of Innovation Decision Process which can be divided into 3 parts as follows;



1. Cause or antecedents consists of personal characteristic variables such as attitudes about social characteristic change of individual. For example, a person has the cosmopolitan idea which is not tied with local idea and contacts with persons or

institutions of the other societies, the degree of innovation need of the person who accepts innovation has an influence on individual's process of adoption.

Moreover, the social system where there are persons who accept innovation such as social norm, tolerance for deviancy, communication (at the degree that social units are integrated by message channel between person), etc., is affected by the two variables- message receiver and social system. These variables show that innovation has occurred without completed details. The characteristics of innovation in the targets' visions, which is one variable that accomplishes the decision process, are;

1.1 Relative advantage of general innovation. Expected benefits are mostly objective or economic benefits.

1.2 Compatibility of innovation with norm, previous experience, beliefs and culture.

1.3 Complicity of innovation is difficult to understand or to implement and becomes the main obstacle for the acceptance from the target group.

1.4 Trialability of innovation can appeal people's interest.

1.5 Observability of innovation can show the benefits of innovation in many aspects such as yielding more products, and earning more income, which lead to more acceptances.

2. Process means process of acceptance, which consists of 4 steps as follows;

2.1 Knowledge. People perceive the existence of innovation and understand its functions.

2.2 Persuasion. People form the positive or negative attitude towards the innovation.

2.3 Decision. People will decide to accept or reject the innovation.

2.4 Confirmation. People search for further information in order to support their previous decision on the innovation. However, they may change their previous decision if they are informed contrary or negative information about the innovation.

3. Consequences mean acceptance or rejection of the diffused innovation with more details such as acceptance of innovation, with continuation of acceptance or with abortion of acceptance and turning to other innovations or with dissatisfaction of the results from that innovation. In case of rejection of innovation, more details are stated such as rejection of innovation and accept it later or rejection of innovation with continuation of rejection.

The model of Roger and Shoemaker has great impact on sociological work in Thai society. This impact is obvious in sociological, communicational and agricultural development work, especially in adapting these sciences with rural area development project. The researchers noticed that the diffusion of this theory emerged when the early versions of Economic Development Plan were implemented and the development of urban and suburban was required immediately. At that time, the economic status of the country relied on agricultural sector therefore encouraging the farmer to use new agricultural technology may support the economic of the country. From this hypothesis, it might be said that the former study of acceptance tended to have new agricultural technology such as chemical fertilizer, high yielded grain,

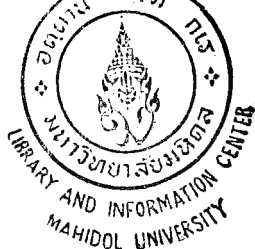
pesticide, and plows as the innovations mostly studied. The sources of distributors are the high academic institutions of the society such as university, Agricultural Educational Technique Department, and Agricultural Experimental Center, with the farmers in rural area as their target group. The promotional methods are stimulating, provoking, persuading, which are aimed to make the farmers interest in, accept and apply the new concept. We call this process "agricultural promotion" which occurs step by step.

### **The Factors of Acceptance**

The factors that result in the simplicity or difficulty, rapidness or slowness of individual acceptance depend on; (Direk Rerk-rai, 1981: 124-134)

1. Relative advantage. It means innovation which is better than old ones comparatively.
2. Compatibility. It means innovation compatible to the old values and previous experience of the person who accepts it.
3. Complexity. It means innovation which is not complex to understand and to apply.
4. Divesibility. It means innovation which can be divested to make an experiment. This will lead to more acceptances than the innovation without divesibility.
5. Communicability. It means the results of innovation which can diffuse to other people.

Lionberger (1960) cited in Sirirat Bamroongkorn, 1991: 22, concluded that innovation acceptance depends on:



1. Perspective and practice of innovation can be mixed with genuine concept and application.
2. The real needs of the farmers.
3. The benefits from innovation.
4. The complexity of innovation.
5. The educational level of the farmers.
6. The influence of social group on the farmers, and attitude and norm of the farmers.

In addition, acceptance or rejection of the farmers also depends on the social environment of the farmers.

Lionberger (1960: 38-39) also explained that the early acceptance group owned large farms and had highly averaged income. These persons liked to take risks. Most of them are in the middle ages or younger but some of them might accept early when they are aged. The early acceptance group like to try new things in their farms and are the members of local organizations or groups more than the slowly acceptance group. They are interested in general information and contact with agricultural promotion officials more than the slowly acceptance group. They are more educated and like to learn new things than the slowly acceptance group.

Roger and Shoemaker (1971: 185-189) listed the characteristics of the person who accepts innovation by using socio-economic status, characteristics of farmers, and communicative behavior as criterion. They found the characteristics as follows;

1. Higher educational level.
2. Higher educational capacity.
3. Higher land tenure (capital of production)
4. More contact with people both inside and outside the community.
5. More contact with officials.
6. Higher relations with communication channels.

### **Factors Related to Agricultural Innovation Acceptance**

There are many factors related to the acceptance of agricultural innovation, which are; (Direk Rerk-rai, 1984: 57-61).

#### **Conditional or General Factors**

1. Economic condition has an impact on the acceptance of change. Farmers who have higher land tenure, higher landed property, and higher income will accept some changes more simply and rapidly than farmers who have lesser of those.

2. Social and cultural condition involves in the speed of acceptance. For example, the people in community or society who strictly maintain old customs and traditions believe hereditary social classes and are less communal cooperative. Their norms and beliefs are impediment to change and result in slower and lesser acceptance in change.

3. Geographical condition greatly involves in the acceptance of change. In the area where geographical condition enable it to access other areas, especially the more technologically developed area such as more convenient communication or more natural resources relevant to capital of production, the trend of acceptance will occur more rapidly.

4. Implementation capacity of the concerning institution. The institutions which are relating to the development or the transformation of agriculture are agricultural credit union, the institution of agricultural research and promotion, the institution of marketing management, institutions concerning with the reformation of land, institutions concerning with infrastructure such as road or irrigation construction, and institutions concerning with mass media such as press, broadcasting. If these institutions work efficiently and yield benefits to the target group, the acceptance of change will happen more easily and more rapidly.

#### **Direct Factors**

1. Target person or the person who accepts basic change of the farmers is an essential factor of the change acceptance.

1.1 Social background. From the research, it was found that female accepted change more quickly than male. Higher educated and more experienced farmers accept change more rapidly than those who possess lower education. Farmers, who have more contact with agricultural promotion officials or change agents, get information from radio or other media more frequently than those who have not. Farmers who often participate in the group meeting to exchange idea about occupation with their neighbors have more and more rapid change acceptance than those who have not. Teenagers are the most rapid acceptance group. The more people are aged, the slower the acceptance is.

1.2 Economic background. From the research, it was found that the farmers, who had tenure on more landed property, conducted more commercials on their land, earned higher income, had opportunity to receive more loans and lower

interest rates, owned more resources for production, and possessed more appliance for production, accepted some changes more rapidly and more than the farmers who had fewer of these things.

1.3 Communicative background of the farmers which is very necessary is the efficiency of the method they receive the information, i.e. reading, listening, and logical thinking. Simultaneously, the ability to speak and to write can partly support understanding among neighbors, which creates confidence in more change acceptance.

1.4 Other backgrounds. The farmers who possess achievement motivation, psychological willingness, more relevant information, more positive attitude towards agricultural promotion officials or transformation leader, and/or more positive attitude towards technology leading to change, interest in personal requirement and neighbor's occupation, ability or more ability to manage any of the above agricultural activities have more rapidly and more change acceptance respectively.

2. Factors from innovations which have an impact on acceptance of agricultural innovation under any particular circumstance and environment are;

2.1 Cost and profit. If there are the least investment in and the most profits from any technology, there are more rapid and more acceptance. Profits are not only earning income but also profits from the utility and prestige.

1.4 Similarity and fitness. Similarity and suitability for existing idea in the community emphasize the idea which is not contrary to customs and traditions and communal beliefs, and similar and fit to physical characteristics of existing resources in the community.

2.3 **Practicability and understandability.** Without complexity and difficulty, it is easy to understand, to practice and with relevant material in the community.

2.4 **Visibility.** If the profits occur, it is easy to apply or accept that idea.

2.5 **Divisibility.**

2.6 **Time-saving.**

2.7 **Group decision.** Group has an influence upon some regulations that the members of the group have to follow. Although they may not agree, as members, they have to respect the group decision.

If the characteristics relevant to innovations are complete, acceptance of innovations or agricultural technology or agricultural practice will happen more promptly and more. The swiftness of the diffusion of technology depends on the criterion as follows;

2.8 **The amount of benefits from the application of technology, i.e. more income or other benefits.** The more benefits, the more diffusion.

2.9 **The speed of the occurrence of benefits after application.** Within the shorter time the benefits occur, the more rapid the diffusion of technology. The more the low interest rates agricultural loan for the poor, the more diffusion of technology.

2.10 **Communication.** The more wide-spread of communication, such as roads to the village, and communication network such as radio networks or newspapers, the more rapid of diffusion.

2.11 **Objective of the farmer's production.** The more commercial the production, the more diffusion of technology.

2.12 Imbalance with existing life style. If the farmers think that their life style is lower than general living standard and feel theirs is regular condition, the diffusion of technology will be slow.

2.13 The similarity and contradiction to social and cultural condition of the community. Without contradiction, the diffusion of technology will be more rapid.

### 3. Factors from the leader of change or the agricultural promotion officials.

The most important thing to create change is the attempt to serve the society in order to enhance the living standard of the farmers. In so doing, the agricultural promotion officials have to convince the farmers. They must possess communicative ability, the competency to transmit information such as speaking and writing, reasonableness, and ability to receive the information such as listening and reading. These abilities include the ability to select the news medium.

One more important issue is that the officials must believe in technology using for change and possess some knowledge of that technology in order to accomplish it. They must possess positive attitude towards the target group, the farmers, and feel sympathy for them. The officials must know the limitation of the farmers, i.e. why they do not want to take risks from innovation acceptance, why they do not want to work, why they are satisfied with their living standard though it is lower than the general living standard.

Krajang Panthumnavin and others, (1975: 22-25) gathered and edited Milikan's analytical work on factors that affected agricultural development or factors that concerned with innovation acceptance. It can be summarised as follow;

## 1. Physical factors

1.1 Demands for material which are land, weather, grains or seeds, water, fertilizer, pesticide, plants, buildings, houses, animals, pets, tools and machines, fuel, and other sources of energy which are not animals.

1.2 Demands for labor

## 2. Economic factors

2.1 Transportation, warehouse, processing and marketing system of agricultural products.

2.2 Procurement and distributing system of raw material and credit system.

2.3 Raw material prices and loaning interest rates.

2.4 Prices and retail prices of agricultural products.

2.5 Taxes, subsidies, quotas and sale systems.

## 3. Working system and management method factors

3.1 Land rent system

3.2 Land size

3.3 General state policy and administration

3.4 Farmer group (privately formed or formed by the state) aims at enhancing production capacity such as irrigation and labor saving devices, providing economic services such as buying and selling group, credit group, and other forms of cooperation, providing social services such as health center, school, etc., establishing self-administration within local, and distributing knowledge such as adult education, junior farmers, etc.

#### 4. Social, cultural and psychological factors

4.1 The status of farmer organizations or agricultural institutions, the common practices and values of the communal society in the country.

4.2 Factors from the public administration system such as bureaucracy structure and bureaucratic practices.

4.3 Social structure, cultural values and the movement of farmer communities.

4.4 The process of social change, change barriers, change drivers, relations between the impact of change to other parts in the society.

#### 5. Technical factors

5.1 Administration and management system of basic and applied research.

5.2 Diffusion of the knowledge about production technical such as damage to the cultivation from chemical using, soil and soil enrichment, water system, agricultural engineering, pest eradication, domestic science.

5.3 Knowledge in economic such as land utilization economic, general economic and farm management.

5.4 General educational level such as literacy, adult education, mass communication system.

## **2.2 The Principle of Sustainable Agriculture**

### **2.2.1 Sustainable Agriculture**

Sustainable agriculture has received greater attention among Thai farmers during the past decade. This concept offered another alternative to farmers who suffered from the rice's price crisis, in 1985.

### **The concept and Definition of Sustainable Agriculture**

Vitoon Lianjumloon (1991: 101), sustainable agriculture worker in NGO, defines sustainable agriculture as “alternative agriculture which its activities incline toward ecological harmony. The system is sustained without adverse effects on environment and quality of life of farmers and consumers”

Chanuan Rattanawaraha (1991: 24), Official in the department of agriculture promotion, defined sustainable agriculture as “ the capacity of system to maintain the rate of production without environmental degradation which can be observed in both specific characteristics of that local area like soil acidity, salinity, flooding and temporal events like flooding, dry climate, pathogens and so on”

Chom Innurak (1997: 42) said, “ Sustainable agriculture concentrates on the effective management of natural resources in the production process without entailing of negative impacts to people, animals, natural resources and environment, as well as economy. This agricultural system also pays attention to biodiversity and the reduction of toxic contamination in products and environment as well as in the production process for household consumption with the aim of self-reliance of the agriculture.

The agricultural development with modern agricultural pattern is now facing failure and farmers became bankruptcy. Most people are placed on malnutrition. Human intensively attacked nature so that they nearly do not survive. According to pollution, many communities are in the risk of breakdown. It can be concluded that the current development of agriculture is unsustainable therefore “sustainable agriculture” is emerged as alternative agriculture. (Kamala Pasin, 1992: 11-38)

There are many efforts attempting to understand sustainable agriculture. Many of them perceived that the concept of alternative agriculture concentrated on environmental problems and ecological system while sustainable agriculture was viewed as a part of the way of life and existing socio-economic system under complex ecological conditions. To understand the philosophy and definition hidden behind the concept of sustainable agriculture, the paradigm shift from reductionism approach (seperate) to holistic approach is essential.

### **Relevant Factors of Sustainable Agriculture**

Sustainable agriculture involves three contexts, which consist of (1) economy, (2) environment, and (3) society, politic and culture. These three factors can not be definitely separated due to overlapping relations as a complex network. (Chom Innurak , 1997: 42-45)

#### **1. Economic Aspect**

Sustainable agriculture differs from modern agricultural system. Sustainable agriculture refuses the export-oriented production but emphasizes on the production, which serves consumption in local market. The shift from export-oriented production to subsistent production helps farmers liberate themselves from the hegemony of market economy system, where farmers loose their self- reliance and are treated as chess.

#### **2. Environmental Aspect**

The relation in the biotic community consisting of plants and animals is complex and is presented in form of interdependence and antagonism. Such

characteristics are fundamental functions to sustain ecological system. Agricultural ecosystem is a part of the entire local ecosystem, which bases on the resource cycle and succession. Sustainable agriculture pays attention to the cycle system and relation between agricultural ecosystem and the entire local ecosystem. Agricultural practices incline toward local ecosystem harmony without destroying the ecological balance and providing the adverse impacts to resources cycle, being as natural mechanism to maintain sustainability.

The diversity of plant and animal species is another key factor of sustainable agriculture because it reduces the risk from natural disasters and the fluctuation of crop price in economy market. Therefore, agricultural practices with the techniques of polyculture pattern can help farmers to liberate themselves from economic dependence on monoculture. In addition, farmers can take advantages from the diversity of plant and animal species, playing a role as genetic bank for genetic improvement. Furthermore, the society especially, in the field of medicine and others industries, also gains the benefits from the genetic diversity

The health of producers and consumers is recovered due to the reduction or stopping of chemical input in the food production system, and the consumption with high nutrient food rather than commercial plants and animals which mainly focus on quantity and external features. A good health of producers and consumers is fundamental to social development, which focus on human development rather than objects.

### **3. Social, politic and cultural aspect**

Autonomy is an outstanding characteristic of agricultural way of life, particularly, when it is compared with industrial sector. Farmers may design their own

way on production system and operating time and have a power to make a decision in many processes independently. However such freedom have been obviously decreased due to the agriculture development in the past. The farmer's activities have been limited and controlled by external institutions (such as market mechanisms, law) for example; the selection of plant and animal species has been controlled by demand-side of market system, the techniques to select the species for cultivation has been subjected to the research in the laboratory. These situations entailed pressures to farmers particularly after contract farming agribusiness was adopted in agricultural sector because this system allowed the commercial firm to make a decision in all functions of production process instead of farmers. It changed farmers to be wage labor in their own land. Therefore, sustainable agriculture must bring or revive the independent way of life back to the farmers.

The mean of production in sustainable agriculture also inclines toward the coexistence of people in form of local community because the mean of production and farmer ways of life is related in the way of interdependence. However, it could not refuse that the mean of production organized by only one farmer provides more or less impact to neighboring communities.

Social justice and equity is another target of sustainable agriculture. It can be started with the distribution of land tenure and the participation on local resource management in order to establish real social justice and equity.

### **The types of sustainable agriculture**

Sustainable agriculture is a system, which concerns ecological harmonization. It does not damage environment as conventional agriculture does. Although the concept and practices are presented in various forms due to the different

condition of socio-economic and cultural aspects in different places, sustainable agriculture still bases on the philosophy of holistic and applies nature as a model for agricultural system. At present, sustainable agriculture consists of various groups as follows; (Vitoon Lianjumloon, 1996: 32)

**1. Biodynamic Agriculture** is established with the concept of holistic agriculture presented by Rudolf Stridener. This concept is continued by at least 2 writers named; Hans Driesch and Ehrenfried Pfeiffer. The latter writer presented his idea through 3 works as follows; *Biodynamic farming and Gardending* (1943), *The earth face and humanity destiny* (1947) and *biodynamices: Three introductory articles* (1956). While A. Baker wrote "The laboring earth" in 1940.

The roles of this group became outstanding in the 1920s and expanded their influence elsewhere particularly in Germany in the 1930s. Government recognized biodynamic farming as one important social movement. The concept of biodynamic views the agriculture as a way of life. Farmers are responsible to their own land and have close relation to plants, animals and biotic resources in their farms because all mentioned things imply the sources of productivity and farm's quality. Agricultural system must establish the ecological balance and does not depend on external factors. However, it does not mean that this group allows nature managing everything but man must work with nature and does not intervene functions which natural process can perform by itself.

Some characteristics of biodynamic farming system is similar to organic farming's, for example, soil fertility is maintained by non-chemical use, waste recycle, polyculture with rotation techniques. Soil improvement is important because it is recognized as an origin of fertility of plants, animals as well as human in this world.

The specific characteristic of biodynamic farming is the belief on the energy of cosmo, plants, animals and all living things. This belief is shown in many practices for example, with indigenous knowledge in Europe, the orbital circle of the sun and the moon is applied to the selection of appropriate time and date for plantation. In order to increase the power of the soil, farmers spray the diluted substances into soil (Decha Siripattara, 1990: 103-104)

**2. Humus Farming** was separated from biodynamic farming. This farm has focused on the enhancing of soil fertility by using humus or organic matter. The role of this group is outstanding in the 1930s and the 1960s. D. Brown, I. Roberts, S. Fletcher and S. Waksman were key persons who promoted and distributed the utilization of humus for soil conditioning. These four persons wrote the books concerning the concept and practical principle of humus farming respectively as follows: *The field book of Manures or the American mulch book* (1855), *The fertility of the land* (1907), *Soil: How to handle and improve them* (1907) and *Humus: Origin chemical composition and importance in nature* (1954). Besides the development of techniques to produce composting and green manure, as well as, the study of the impact deriving from chemical fertilizer, the philosophy of this group has encouraged the movement of organic farming particularly the 3 works of F. Skes: *Humus and the farmer* (1943) *Food, Farming, and the Future* (1951) and *Modern humus farming* (1959) and the works by A. Seifest : *Compost* (1952) (R.R. Harwood. 1991. pp.8).

**3. Organic Farming** was developed in the same period as biodynamic farming. This group was initiated in Europe. The distinction between biodynamic farming and organic farming is that biodynamic farming has concentrated on philosophy while organic farming gave the priority to agricultural researches. Initially,

there were many works and researches concerning organic farming system. For example; in 1936 Alwin Seisfest presented his research with regards to organic farming to Ministry of Agriculture of Germany. He emphasized on the significance of mulching and no-tillage techniques while the monoculture requiring large space for plantation or pasture was refused. "An agriculture testament " the master piece of Sir Albert Howard, published in 1943 provided the first basic principle of organic farming. In 1944, Lady Eve Bulfour published her work "The Living Soil" which explained the complex web of energy utilization and the line that generated the fertilities and linked sun to soil, bacteria and biotic resources to plants, to animals and finally to man.

However, the movement of organic farming in Europe was stagnated during the World War II until in 1960, Soil Association revived the role of organic farming. The documentary papers and magazines concerning the concept and works of organic farming were published and distributed. The main functions of this organization was to study the impact of chemicals to man. In addition, it was the first group that encouraged the environmental concerns in England.

Organic farming group has been expanded simultaneously to the United Stated of America, France and Canada particularly to Japan where organic farming played an important role in the 1970s. The well known scientists and doctors realizing the danger of medicine and chemical contamination in food has established the cooperative named "Nippon Yukinogyo Kenkyukai" in order to provide the space for non-chemical food producers and consumers to make a deal. Organic farming group in Japan has linked the concept of organic farming adopting from Europe with the Japanese traditional agricultural system.

**4. Regenerative Agriculture;** Regenerative Agriculture defined by Robert Rodale as “sustainable agriculture which enhances soil fertility and the efficiency of production”. Therefore, it has high economic and biological stability. In addition, the destruction in off-site ecosystem is decreased, non-harmful chemical is used in food production process. This system can meet the economic viability during the transition to agricultural system, which reduces the level of dependence upon non-renewable resources. (D.B. Grigg. 1987.pp.7)

The current regenerative agriculture has penetrated their roles in Asian region through the support of IIRR, headquarter in Philippine. In Thailand, the training on regenerative agriculture was held in lower northern and central region in 1987 (Vitoon Lianjumloon, 1996: 39)

**5. Nature Farming.** Although this concept is not a new issue, it is in the process of development and operation as a movement with the aim of creating the permanent agricultural system. Therefore, In terms of concept, there are many definitions of nature farming due to different viewpoints and developments (Somsak Podduang , 1995: 12)

The goal of nature farming is to eliminate the damages or impacts from advanced technologies and overuse of chemical fertilizer and substances in the current agricultural system. Mokichi Okada (1882-1955) was the first person who referred to nature farming. He aimed to encourage others to concern the balance between nature and agriculture. Besides the significance of nature, Mokichi Okada pointed out that the agricultural system should also serve the food production which cares good health of human beings.

According to the principle of nature farming, Agriculture was viewed as innovation. It has shaped the present pattern of human society because the formation of agriculture led to the human settlement as a community instead of wandering society which their subsistence up to food gathering and hunting in a wild. In the period of wandering society when agricultural is not yet formed, food gathering in the forest was the product from the nature. Hence, the formation of systematic agriculture was a starting point to adapt nature for serving human's needs. In order to gain food surplus without wasting time to find out wild food, it is necessary to adapt nature for agriculture purpose, for example, forest is clearly cut for cropping area. Therefore, nature can be destroyed by agriculture in case of over adaptation leading to the violation of the natural law. Naturally, plant species exist as a guild like human's community. According to the plant diversity and the advantages of their multi-layers like the improvement of soil fertility and natural energy in nutrient cycle, plant diversity may work out as a natural tool to control pest and to maintain the ecological balance. In contrast, the agricultural areas covered with only one plant species do not facilitate the use of natural energy. In addition, plowing until there is no any plants except cash crop species makes organic decrease.

Moreover, after harvesting, organic matter is not turned back to the cycle, the flow of nutrients in nature is broken. The agricultural area has therefore, less fertility gradually leading to soil degradation. The more soil is bared, the more soil erosion by rain and wind weathering occurs. Soil with less organic matter decreases the capacity of moisture retention because of high temperature of soil surface so that it obstructs the growth of plants. This problem can be observed in Northeastern of Thailand where soil has been turned and bared so that plants could not grow. The

chemical use in agriculture system has directly destroyed the ecological system. The use of chemical pesticide accelerates the development of resistance by pest and resurgence and secondary pest outbreak. All problems are associated with mispractices in agricultural system because it contradicts with basic natural law. While the chemical agricultural system is going downward, nature farming is gaining greater attention.

Ecological agriculture is another kind of nature farming. It focuses on no tillage technique. This concept has been developed and promoted by Masanobu Fukuoka, Japanese philosopher and the author of "The one straw revolution". It received greater attention among people and academicians worldwide as alternative agriculture. This new concept aims to comply with the natural law of working with nature by allowing nature manage itself with less human intervention as possible. Fukuoka spent about 30 years to study and to develop the nature farming pattern and techniques and finally he succeeded to find out the appropriate agricultural pattern and practices for his hometown. (Rodsana Tositrakul,1994: 1-12). Masanobu Fukuoka insisted that nature farming could be applied worldwide because nature is the root of life but the pattern must be adapted with regards to the specific characteristics of that local area. However, such pattern and techniques must be accordant with natural law. The general techniques consist of 4 categories as follows;

- 1 No-tillage
- 2 No-weeding
- 3 No-chemical fertilizer use/ composting manure is used instead.
- 4 No chemicals use

Nature farming is not only agriculture, but also it is a mean to complete human and to access nature. The concept presented by Masanobu Fukuoka has been extensively widespread to Philippine, Indonesia and Bangladesh as well as Thailand where Pasri Kamdueng successfully applied this concept for his farm in 1990. His success has stimulated farmers from all regions of Thailand adopted this concept for their farms.

**6. Kyusei Nature Farming:** Mokichi Okada, religious founder of Sekei Kyusei Kyo, developed Kyusei Nature farming in 1953. This concept inclines toward the belief that “The earth can be turned to be heaven by eliminating serious diseases, poverty and conflicts”. Kyusei nature farming differs from other agricultural system. This system gives the priority to the utilization of effective microorganism (EM), developed by Professor Higa. This microorganism is applied to accelerate soil conditioning. At present, every organization established by Sekai Kyusei Kyo ( in Thailand, this religious is known as Yore) has promoted Kyusei nature farming in many countries such as Thailand, Taiwan, Brazil and the United States of America. (T. Hussain, 1992: 113-117)

**7. Permaculture:** Fukuoka in his “The one straw revolution” has perhaps best stated the basic philosophy of permaculture. This system has focused on the philosophy of working with nature and of looking at plants and animals in all functions or their intrinsic value rather than production system to serve only human’s need. Permaculture is applied in order to meet the basic physical and mental needs. Permaculture deals with the productivity of the early stage of food chain and techniques of waste and energy recycle. The difference between permaculture and other sustainable agriculture is that permaculture gives priority to spatial and physical

design, planning, cropping management, resident area and other activities entailing the efficiency and responding the principles as much as possible.

Permaculture was developed in Australia in 1978. Bill Mollison and David Holmgren have played a vital role on the concept of permaculture by publishing many works such as *Permaculture one: Perennial Agriculture for Human Settlements* (1978), *Permaculture two: Practical Design for Town and Country in Permanent Agriculture* (1979). At present, farmers from every region with difference climates in Australia have adopted and applied this concept. Moreover, this concept is also getting the support in the worldwide. (Vitoon Lianjumloon, 1996: 41-42)

### **2.2.2 MOA Nature Farming**

The Vocational Training and Development Center for Thai People along Thai-Cambodia border areas , Sakaeo Province, has promoted and developed the agricultural career with the concept of MOA nature farming. This organization sent their staffs to attend the training courses and then has applied techniques of MOA nature farming in their experimental project started in 1994. Until now this experimental project is success and its results are distributed to farmers living near border.

#### **Background of MOA Nature Farming**

Since, Mokichi Okada, would like to help Japanese farmers suffering from natural disasters, he tried to practice alternative agriculture and established MOA nature farming. In 1935, the results from experiment could help farmers and make them healthy. In 1953, Mokichi Okada established MOA nature farming and distributed the concept of nature farming throughout the country. However, according to social condition during that time, it was difficult to adopt this concept. Japanese

government had being promoted modern agriculture with the objective of increasing rate of productivity. The government promoted the utilization of chemical fertilizer and chemical substances in agricultural system as Europe and the United States of America did successfully without negative impacts. Mokichi Okada and other change agents in this field had distributed their philosophy in a midst of resistance by people. In the late of 1960, The problems of pollution and health, which Mokichi Okada has ever referred to, received a greater attention in the society. The utilization of chemical fertilizer and chemical substances in agricultural system entailed pollution and loss of agricultural areas intensively. These chemicals provided the adverse impact to plants and productivity. Moreover, the toxic contamination in food production process was a major concern among people. Since, MOA nature farming not only has protected agricultural area but also the good environmental quality for plantation, it received the greater attention and understanding (MOA Foundation, 1996)

In 1985, the minister of agriculture, forest and fishery agreed with the results of MOA nature farming, recognized as NGOs, and allowed to establish the foundation of the international agricultural research and development. This organization has distributed the agricultural practices presented by Mokichi Okada.

### **The Philosophy of MOA Nature Farming**

The philosophy of MOA nature farming is strategies of soil rehabilitation until reaching the potentials, as found in nature, and the optimization of the limited resources as well as building of environmentally sound (without soil, water and air pollution as well as malnutrition) and economically viable (high productivity and stability) agriculture and subsistent system. The philosophy of nature farming consists of 4 categories as follows;

- (1) Agricultural product without or less toxic contamination.
- (2) Maintaining the quality and quantity of productivity.
- (3) Cost reduction by pest control with natural techniques and by the reduction of chemical use.
- (4) Environmental friendly system without adverse impacts to environment and natural resources.

### **The Means of MOA Nature Farming**

#### **1. Soil Survey**

MOA nature farming, started in Japan, has based on the observation and experiment. According to the soil observation in the temperate island of Japan, it was noticed that the dense forest was grown and existed without fertilizer input. In addition, due to the observation of natural system, the topsoil in the forest is covered with foliage while subsoil is humus layer built up from decomposed organic matter. Trees in the forest were grown on 10-20 cms depth of humus layer. Organic substances in the soil decompose organic matters such as foliage, animal manure, dead animal (carcass) and insects and finally these organic matters are transformed to soil particles. This cycle is essential to maintain soil fertility and potential of plantation. If this cycle is broken down, it means the decreased level of soil efficiency. When we input too much chemicals and indigestible materials to soil, the numbers of some living organisms are lessen but some are higher leading to soil imbalance and less productivity. Therefore, plantation can be carried out with the techniques of living soil.

## **2. Mulching**

It is difficult to see bare soil in the nature because most soil is covered with foliages or grasses. Due to the significance of topsoil for the growth of plants, mulching is indispensable to protect this soil layer.

### **The Advantages of Mulching**

- (1) Soil protection from soil weathering by rain and wind.
- (2) Soil moisture retention and reduction of adverse impacts on soil caused by dry and wet.
- (3) Loosening compacted earth entailing a favorable environment for root penetration.
- (4) Increasing organic substances in soil for ecological balance.
- (5) Suppressing the growth of weed.
- (6) Controlling soil temperature.
- (7) Adding nutrients from decomposed materials. Mulch materials are dry leaves, small pieces of rice straws, wheat and grasses

### **The Utilization of Composting Manure**

The characteristics of good soil for plantation are as follows;

- (1) Crumbly soil with high capacity of moisture retention and air circulation
- (2) Porosity
- (3) Complete nutrients
- (4) Complete organic substances

Adding composting manure is one of the best ways to improve soil quality and to build favorable environment for plantation. Materials used to produce

composting manure should be available and easy to collect, for example, for paddy field, rice straws, reeds and giant reeds can be applied to be composting materials, while wheat straws, grasses, foliages, twigs and vegetables gathered after harvesting is suitable for highland cropping. In other hands, cattle manure can be added in nutrient deficiency soil. However, over-input of manure will lead to soil salinity because of the accumulation of sodium and potassium chloride.

### **The Production Process of Composting Manure**

(1) First, controlling and maintaining the soil moisture at the curtain level in order to build favorable environment for microorganism working as organic decomposer.

(2) If high C/N (ratio of carbon against nitrogen) materials are used as ingredient of this process, adding more low C/N materials or composting manure is required.

(3) Occasionally, the composting heap should be turned inside out in order to facilitate the whole decomposing process. This step will be carried out when the temperature of the composting heap is beyond the favorable level. The appropriate temperature of materials likes dry leaves, rice straws, reeds and giants reeds is at 60-70 C°. while the temperature of soft fiber materials like fodder is at 50-60 C°.

(4) To accelerate the function of decomposing process by microorganism, The following natural materials should be used as ingredients of composting manure;

- Green grasses or weeds contain high sugar and protein, which is bacteria's food.

- Weed's root contains a lot of useful bacteria such as Microrhiza

- Foliage contains varieties of microorganisms

composting manure should be available and easy to collect, for example, for paddy field, rice straws, reeds and giant reeds can be applied to be composting materials, while wheat straws, grasses, foliages, twigs and vegetables gathered after harvesting is suitable for highland cropping. In other hands, cattle manure can be added in nutrient deficiency soil. However, over-input of manure will lead to soil salinity because of the accumulation of sodium and potassium chloride.

### **The Production Process of Composting Manure**

(1) First, controlling and maintaining the soil moisture at the curtain level in order to build favorable environment for microorganism working as organic decomposer.

(2) If high C/N (ratio of carbon against nitrogen) materials are used as ingredient of this process, adding more low C/N materials or composting manure is required.

(3) Occasionally, the composting heap should be turned inside out in order to facilitate the whole decomposing process. This step will be carried out when the temperature of the composting heap is beyond the favorable level. The appropriate temperature of materials likes dry leaves, rice straws, reeds and giants reeds is at 60-70 C°, while the temperature of soft fiber materials like fodder is at 50-60 C°.

(4) To accelerate the function of decomposing process by microorganism, The following natural materials should be used as ingredients of composting manure;

- Green grasses or weeds contain high sugar and protein, which is bacteria's food.

- Weed's root contains a lot of useful bacteria such as Microrhiza

- Foliage contains varieties of microorganisms

- Decomposed organic matters in water contain a lot of bacteria and support photosynthesis of actinomycetes fungus.

### **Soil Conditioning by Crop Rotation**

Plant rotation is a popular technique for a long time and is recognized as a significant tool of nature farming. Plant rotation keeps most organic matters in soil, and enhances the growth potentials of microorganism leading to crumbly soil and better physical characteristics. The principle to design the rotated cropping system is to select species, which enhance the physical and chemical soil conditioning, for plantation such as leguminous species (peanut, soybean, holland bean etc.). Generally, root crop, vegetable and fruit orchard is also planted independently. After mix cropping with rice and legumes has been harvested for 3-4 years, we continue rice cultivation and some vegetable plantation with regard to soil suitability and economic viability.

### **The Utilization of Green Manure**

For a broad scale of agricultural system, to apply composting manure confronts economic and labor problems, therefore, green manure is used instead to improve soil by growing plant species for green manure in rotated agricultural system. Plants for producing green manure are plant species in forage system such as oat, corn and legumes because these plant species have higher organic matter, nitrogen and phosphorus than other species as well as wider root zone. All mentioned above concerns the improvement of physical, chemical and biological properties of soil and the topsoil protection. Particularly, legumes effectively enhance the rehabilitation of soil fertility. After green manure is mulched or turned into soil, that cropping bed must be left for a while before performing the next cultivation.

### **Pest and Weed Control**

MOA nature farming believed on the principle of rational existing of all living organisms in the world. This belief is shown in the natural world that although animals and plants are viewed in general as pest and weed, their existence is essential to ecological balance. However, people still recognize that insect pest and plant diseases are the indicators of degraded natural system. Therefore, nature farming agrees that soil improvement for better cultivation is a base of insect pest control. It emphasizes on the preventive strategy. However, when this problem arises, we can solve it by applying the natural techniques, which do not pollute soil and environment.

#### **Pest Control**

The pest prevention applying various patterns of plantation is known as ecological preventive approach, which consists of the following techniques

(1) Do not turn undecayed organic matter into soil because these materials produce organic acid and other gases such as ammonia, which is harmful to plant's root.

(2) Seasonal cropping. The cropping sequence is determined by the traditional cropping calendar leading to good cultivation.

(3) Do not cultivate during the period of pest outbreak. Time stacking is important to avoid the damages from pest.

(4) Mixed cropping system should be performed in order to build the environment with regard to the coexistence of predators (natural enemies).

(5) To use the strong seed without diseases. Rice seed can be thoroughly classified by specific weight.

(6) Natural enemy. In the past, it was successful to apply bee as natural enemy to control pest in fruit orchard. By now, with this concept, the United States of America has invented commercial products to control pest for vegetable bed.

### **Weed Control**

After nature farming has been conducted for many years, soil fertility has been improved. It also changed weed species. When the numbers of grasses decreased, it is comfortable to eliminate weed. All mentioned evidences have shown that soil improvement is essential for weed control. The preventive strategy is better than passive strategy, which eliminating weed after it grows up. The preventive strategy consists of various means such as plowing in autumn season allowing weed sprout, differently required water by weed and rotating crop system with crop, paddy field and cover crop etc. In addition, farmers should do not let land uncultivated and must pay attention to screen out weed seeds from compost and plants seeds.

### **Livestocks**

According to livestock management, to build environment concerning the health of livestock is recognized as the first priority to be performed. The shelter must be located in the area where air is well circulated and it must face to sunlight. The numbers of livestock must be appropriated to the shelter's area. Food for livestock should be natural products from nature farming, which did not contaminate antibiotic and hormone to accelerate growth. The techniques for waste management should be environmental friendly such as appropriate decomposition and fermentation.

### **Natural Fertilizer in MOA Nature Farming**

The Vocational Training and Development Center for Thai People along Thai-Cambodia border areas, Sakaeo province has applied the MOA nature farming to

develop the agricultural career. This organization has focused on the improvement of soil fertility by using natural or organic fertilizer from residues. When living organism die, they slowly release plant nutrients. Since, the releasing rate is nearly equal to the degree of the nutrient absorption by plants, nutrient is always available for plants during the growth period and loss of nutrient is less. The decomposition of organic matter also produces the cementing agent to attach and to transform soil particle into soil texture with fine porosity. This soil property is good for water retention and air circulation, but this cementing agent exists within one year so organic matter must be continually added. However, some farmers who would like to improve degraded soil or to increase the productivity has changed to use chemical fertilizer, this technique has provided a good result in the early years of cultivation, but later farmers have faced the problem of the increasing demand for chemical fertilizer.

### **The Types of Natural Manure**

At present, farming ignores natural system, because the negative impacts from chemical uses is not yet recognized. However, there were many evidences to prove that chemical uses entailed the negative effects, it made some people turn back to nature farming system and tried to produce artificial fertilizer which provides plant nutrients as found in nature. The experiments were successfully conducted and distributed worldwide. Natural fertilizer consists of 4 types, which have different applications. However, it is better to use these fertilizers together shown in Table 1.

### **Composting Manure**

Composting manure is produced from crop residues and animal excretion but sometimes we must add microorganism (paw-daw 1) in order to accelerate the composting process. To reduce temperature and to increase aeration, we must turn a

	<b>Natural fertilizer</b>	<b>Chemical fertilizer</b>
1. Nutrients	Lower nutrient but all supplementary elements as plant's needs.	Higher nutrient and easy to up-take due to dissolving property.
2 Productivity	Lower productivity in short-term but higher productivity in long term due to soil improvement by natural fertilizer.	Higher productivity in short-term but lower productivity in long term due to soil degradation by chemical fertilizer.
3. The effects on the chemical properties of soil	No negative impacts on chemical properties but resistance of the pH change and holding nutrients in soil.	Some fertilizers such as Ammonia Sulfate, Ammonia Chloride etc., generate soil acidity.
4. Effects on the physical properties of soil	Soil particle is transformed to soil texture with fine and crumbly structure, excellent aeration, water retention and water infiltration.	There are some fertilizers contaminated with other chemical substances. Such contamination leads to soil compaction especially, when soil is wet, it is unsuitable environment for the growth of plants.

**Table 1** The Comparative Table between Natural Fertilizer and Chemical Fertilizer

	<b>Natural fertilizer</b>	<b>Chemical fertilizer</b>
5. Effects on the biological properties of soil	Providing food for soil microorganisms leading to the enhancing of microorganism's activities especially, the nutrient transformation in forms of plants absorption.	Providing food for microorganisms but food is rapidly used up because it accelerates the process of decomposition of organic matter.
6. Sources	Cheap and available in local area.	Expensive.
7. Pricing	With regard to quantity of nutrient, it is more expensive than chemical fertilizer. However, when the other costs (such as cost of soil conditioning in long-term period) are concerned, it is cheaper than chemical fertilizer.	The cost of collecting is cheaper and more convenience but long distance.
8. Collecting	In case of long distance, it is difficult to collect, therefore, the cost of collecting is expensive. Generally, the	The cost of collecting is cheaper and more convenience but long distance.

	<b>Natural fertilizer</b>	<b>Chemical fertilizer</b>
	collecting is performed within local area or crop area.	
9. Application	For one cropping, fertilizer input is required only one time (except for vegetable crop). However, natural fertilizer requires labors to input more than chemical fertilizer's because of the large amount of natural fertilizer.	The frequency of fertilizer input depends upon the plant characteristic so the application is complicated.
10. Loss opportunity	Loss opportunity is less because some nutrients are components of organic fertilizer and some is kept in soil.	Loss opportunity depends upon soil properties, mean and timing of fertilizer input.

pile of compost inside out once a 7-10 days. Water can be added when a pile of compost is too dry.

#### **The Advantages of Composting Manure**

- To improve soil structure
- To provide plant nutrient
- To feed living organism in soil

- To increase a number of the beneficial microorganism

### **Fermented Soil**

Animal excretion and slice bran is fermented with microorganism (paw-daw 1). After 7 days of fermentation process, we must add soil at the same amount of animal excretion and slice bran and continue the fermentation process 7 days more, finally we get fermented soil.

### **The Advantages of Fermented Soil**

- To increase nutrient
- To increase a number of the beneficial microorganism

Fermented soil is applied to increase nutrient because nutrient from composting manure is not enough, therefore, fermented soil can rapidly raise the level of nutrient in soil as needs. Even soil with fine structure but low nutrient can be improved by applying only fermented soil.

### **Soluble Fertilizer**

Soluble fertilizer is produced from residues from green crop or animal manure by mixing such materials with crushed bran and microorganism (paw-daw-1). The favorable humidity is at 60%. These materials should be turned inside out every day. After 7 days of fermentation process, we should cover these materials with plastic net and put them in the basket and then add some water. To stir the materials every three days is required. Before using this soluble fertilizer, we should dilute it with water at the ratio of 1:15-30 (soluble fertilizer against water) which depends upon the soil properties and plant's needs.

### **The advantages of soluble fertilizer**

- To rapidly increase nutrient during the plantation
- To increase beneficial microorganism
- To dissolve nutrient in soil

### **Green Manure**

Legumes are planted and turned into soil in order to increase organic matter in soil. Soil conditioning with green manure is suitable to broad scale cropping system because of the cost effective. Sometimes, fermented soil and soluble fertilizer should be added to get the better result.

### **Soil Conditioning with Natural Fertilizer**

The utilization of composting manure in cropping bed is essential for soil conditioning. We may mix compost with soil at the ratio of 4: 20 centimeters (compost's layer against soil layer) and then add some water. After 7 days, we can start plowing. Before cultivation, we should add fermented soil in order to increase plant nutrient. We should try to add fermented soil at different rates in order to seek the soil suitability of each area. After cultivation, we may add more plant nutrient if plants are noticed in the undernourished stage by pale leaves. In this case, we can nourish plant by spraying soluble fertilizer on plants every 3-7 days or by pouring soluble fertilizer into soil directly every 15 days.

For soil conditioning with green manure, seeds should be sown and plowed in April in order to wait for rain. Sword bean is the popular legume used to produce green manure. After the rain falls, the legumes will sprout and grow. Until 2 months, we will turn the legumes into soil. The cultivated land must be left for 15 days before

adding fermented soil to increase plant nutrients. Finally plowing can be performed as needs.

### **Increasing Plant Nutrients as Needs**

Natural fertilizer to increase plant nutrient in soil consists of fermented soil and soluble fertilizer, which release nutrient for plant more rapidly than composting manure because the quality of composting manure producing from various materials release nutrients at different levels. In addition, if we keep composting manure for a long time, the plant nutrients will be decreased. Therefore, in case of soil nourishment, fermented soil provides higher nutrient than composting manure. However, we may add fermented soil in soil, which already has composting manure. In order to increase plant nutrient at the appropriate level of each area, we should try to add nutrients at different rates.

After cultivation, the plant's stress may occur due to dry weather. Sometimes plant is noticed that it is undernourished. Hence, soluble fertilizer should be applied in order to encourage the consistent growth. Since, during the productive period, plants needs more nutrients, we should often add fertilizer and water in order to increase the productivity.

## **2.3 Relevant researches**

### **2.3.1 Participatory Action Research**

Supapan-Na-Banghang et al., (1988) studied the development of communal organization in Chachoengsao Province. This participatory action research was conducted in 3 villages of Chachoengsao during 1985-1988. The objective was to

study the development process of communal organization in the aspects of self-reliance and participation.

According to the results of the first phase of this research, it proposed that local leader and members of communal organization in the village should play the collective role in the situation and problem analysis as well as solution seeking. Local people mostly would like to solve the problems on economy, production and marketing. They agreed that the religious and cultural development influenced the development of their quality of life as well as the organization and community development.

The second phase of this research was conducted to respond the need of local people on economic issues by promoting learning process and self-reliance as strategies to solve the economic problems, such as, to arrange educational trip for local people, to promote learning process, to form a group of producer organizing direct sale to consumer. According to religious and cultural aspects, the activities in the significant religious and cultural days were held in order to link moral meaning to the daily practices. Such activities helped to revive the old customs, which disappeared from the village.

The results from the participatory action research conducted with the economic, religious and cultural organizations indicated that communal organizations or people groups, formed for the specific activities, were classified into 3 categories due to their different characteristics and potentials as follows,

1. Communal organization naturally initiated and organized by local people had the most potential of self-reliance and participation.

2. Organizations formed by the requests of people and support of external private sector was ranked in the intermediate potential.

3. Organization established by government had the least potential.

Bampen Kiew-wan (1994) studied the participation of people organization in the development of agricultural promotion in Phangnga Province. This participatory action research was conducted in 5 villages of Pangna for 2 years with the aim to encourage the formation of people organization through activities. It was found that the formation process and the activities of people organization in the villages were basically influenced by the former organizations of those villages. Most activities conducted by people organizations explicitly entailed the effect to local people on the economic issue like increasing income and the development of communal resources. Some organizations have played an important role in the development of communal resources. It was found that development of communal resources related to local people's income and economic development. In addition, every organization has conducted the activities entailing the social development in the community such as the local leader development, the development of communal practices and learning process in many aspects and the cooperation by local people as well as better service and welfare from the government officials.

Cherdsak Chumnoom (1997:1) studied information to adjust school's strategies on human resource development project organized by Ministry of Education. Participation in the communal process such as, listening to the problems and responding the communal target, is a main tool of this research. According to the results of this research, it proposed that local people have better attitude on school and educational management. Such better attitude represented through the positive

practices by communal members such as recommendation and comment, participation in school adjustment and activities. These performances were useful to the adjustment process on school's strategies.

Manee Chaitheeranuwatsiri (1998) studied the student, family, school and community development through environmental education: The case study in Baan Phai Lom School, Phai Hu Tambol Phai Hu Charng, BangLen District, Nakhonpathom. The study group consisted of student, people, school and community. Three projects were conducted: Green School Project, Environmental Quality Control Project and The Development of Quality of Life and Communal Environment. This participatory action research was conducted for 6 months.

The results indicated that teacher, student, guardian, people and governmental officials of the relevant organizations have well participated in the projects. After participatory action research, the student's and people's attitude, knowledge and behavior on environment and quality of life was better particularly when comparing with the period before the projects were performed leading to the consistently implemented activities, even the research team removed from the school and community.

From the above studies, it summarized that the process of participatory action research must concern the cooperation with local people and people organization to implement both formal and informal tasks, such as, village studying, problems analysis with the techniques of group interview and focus group, strategy seeking to solve the problems, collective planning, implementation and evaluation. To implement the tasks of participation gave an effect to community in terms of communal education. Participatory action research enhanced the capacity of people

learning and entailed attitude, behavioral, educational and environment changes leading to better quality of life. With regards to communal development, participatory action research could respond to the economic development and the cultural encouragement leading to the communal harmony and formation of interest based group.

### **2.3.2 Researches Relevant to the Innovation Acceptance.**

Dwarlomatj (1973: cited in Sirirat Bamroongkorn; 1989 22-23) summarized the results from various researches which studied the correlation between the acceptance and the variables concerning the farmer's personnel or characteristic data, environment and communication. He found that education and land tenure were the most popular variables, which researchers conducted. They also had statistical significance with the acceptance. Meanwhile, age and information sources were ranked at the second popular variables. The third popular variables were social participation, the connection with promotion officials and socio-economic status.

Prengporn Phewngam (1989) studied people acceptance on the innovation: A case study of people participation on the monitoring of water quality in Ratchaburi Province. She found that the variables influencing the innovation acceptance, were education and the educational means to support the innovation.

Sajogyo and Collier (1973, cited in Sirirat Bamroongkorn; 1989 22) studied the acceptance of new high yield rice species among farmers in Chawa Island, Indonesia. It was found that farmers who occupied large areas of paddy field accepted new rice species more than farmers who had lesser of those. In addition, farmers who accepted changes rapidly had high income from cropping. The acceptance of rice species and chemical fertilizer had different variables. The variables explaining the

acceptance of rice species were land tenure and income, while the variables of the acceptance of chemical fertilizer were attitude and basic knowledge on chemical fertilizer. It pointed out that the independent variables were changed due to the type of the innovation and the crucial variables to explain the event were also different.

Apiradee Komolsiri (1988) studied the factors influencing the acceptance of producing and using of composting manure among farmers in Khao Yoi District, Phetchaburi Province. She found that knowledge and attitude had relation to the producing of composting manure at the statistically significant level of 0.05. In addition, among the farmers who agreed to produce the composting manure, age had relation to the size of agricultural area, knowledge and attitude. Meanwhile, income also related to the size of agricultural area, knowledge and attitude. Size of agricultural area related to knowledge and attitude. Knowledge had statistical relation to attitude at the significant level of 0.05. Among the farmers who refused to produce the composting manure, The statistical relation between age and attitude is ranked at the significant level of 0.05. Meanwhile, income related to the size of agricultural area, knowledge and attitude. In addition, knowledge had relation to attitude.

Narumol Nantamatcha (1989) studied the socio-economic and communication variables influencing the use of chemical pesticide. She found that the socio-economic and communication variables had relation to knowledge, attitude and the utilization of chemical fertilizer.

Simaluk Diteesawaswej (1991) studied the variables relating to the farmer behavior on the utilization of chemical pesticide in Mahasarakham Province. She found that such variables consisted of knowledge, attitude, allergic experience from

chemical pesticide, the frequency of chemical pesticide use (per month) and the period of time to use pesticide.

Supoj Chivimol (1990) studied some factors influencing the acceptance of producing and using of composting manure in Taphanhin District, Phichit Province. He found that the number of labors in household and the connection with officials influenced the knowledge of producing and using composting manure. In addition, the connection with officials and the occupying of agricultural machine influenced the acceptance of producing and using of composting manure.

From the above studies, It could be concluded that the innovation acceptance involved many factors such as sex, age, economic status, information source, educational level, attitude, basic knowledge on innovation, training experience, land tenure and experience from the dangers of agricultural chemical substances.

### **2.3.3 Researches Relevant to Nature Farming**

Sa-ard Yothaphol (1991) conducted the comparative study between natural paddy farming and modern paddy farming using chemical fertilizer. 18 farmers in Surin Province were selected as sampling population. He found that although the productivity from natural paddy farming and modern paddy farming is quite similar, the implementation cost was different. The implementation cost of natural paddy farm was about 150-270 baht/rai, while the implementation cost of modern one, which used chemical fertilizer to improve soil and chemical pesticide, was about 540-850 baht/rai.

Chanuan Rattanawaraha (1991) studied the agroforestry implemented by Viboon Khemchalearm, villager chief of Hua Hin subdistrict, Sanamchaikhet district in Chachoengsao Province. He has ever occupied land about 200 rai, but after following the agricultural system promoted by government, he confronted failures so

he turned to apply agroforestry which entailed the self-reliance on 4 basic needs, cost reduction, higher income and long term productivity with value adds.

Vitoon Lianjumloon (1992) studied the integrated farming implemented by Mahayu Soonthornchai, senior farmer in Baan Tabak, Salakdai, Muang District, Surin Province. Mahayu was very well known in domestic with regards to integrated farming. He pointed out that integrated farming was a perfect farming because the resources in 100 rai was used in such a way of efficiency and interdependence. The farmer was able to earn annually 170,000 baht by selling rice, duck's egg, pig, fish, fruit and vegetable in total 70 species deriving from cropping.

Jaturong Boonyarattanasoonthorn (1994) conducted the comparative study of alternative agriculture and monocropping: Farmers in Udompattana village, Nongbua district, Nakhonsawarn Province, were selected as a case study. He found that there were two agricultural systems: alternative agriculture and monocropping. The average implementation cost (per rai) of these two systems was equal but the alternative agriculture had higher income than monocropping. In addition, the alternative agriculture helped to reduce losses, to encourage self-reliance, to strengthen family institution, to entail good mentality, to create sound environment and biodiversity as well as to save time and labor more than monocropping did.

Vittaya Vongkool (1989) studied the mixing agriculture implemented by Chalee Marasaeng, farmer in Baan Kudsuoi, Khumpra subdistrict, Huataphan district, Ubonratchatani Province. Chalee was able to turn his dry land to be fertile land covered by mixing agriculture. The advantages of this agricultural system consisted of the stability of production, income distribution, reduction of food cost, the stability of

family institution and environmental conservation and rehabilitation as well as the biodiversity enhancement.

Somsak Phodduang (1995) studied changes in attitude and behavior and practices on nature farming among participants of the Vocational Training and Development Center for Thai People along Thai-Cambodia border areas, Sakaeo Province. He found that the level of knowledge and attitude of these participants were higher when comparing with the time before conducting training.

From the above researches, it noticed that nature farming helps to reduce cost leading to self-reliance, the stability of family institution, better ecosystem and environment and diversity. All these advantages will encourage the positive development, which is a base of sustainable development.

## **CHAPTER III**

### **RESEARCH METHODOLOGY**

This research was the Participatory Action Research as a research and development for developing nature farming. The research methodology used a qualitative for data gathering in field work along side the underprivileged villages along Thai-Cambodia border-areas, Sakaeo province.

#### **3.1 Conceptual Framework of the Research**

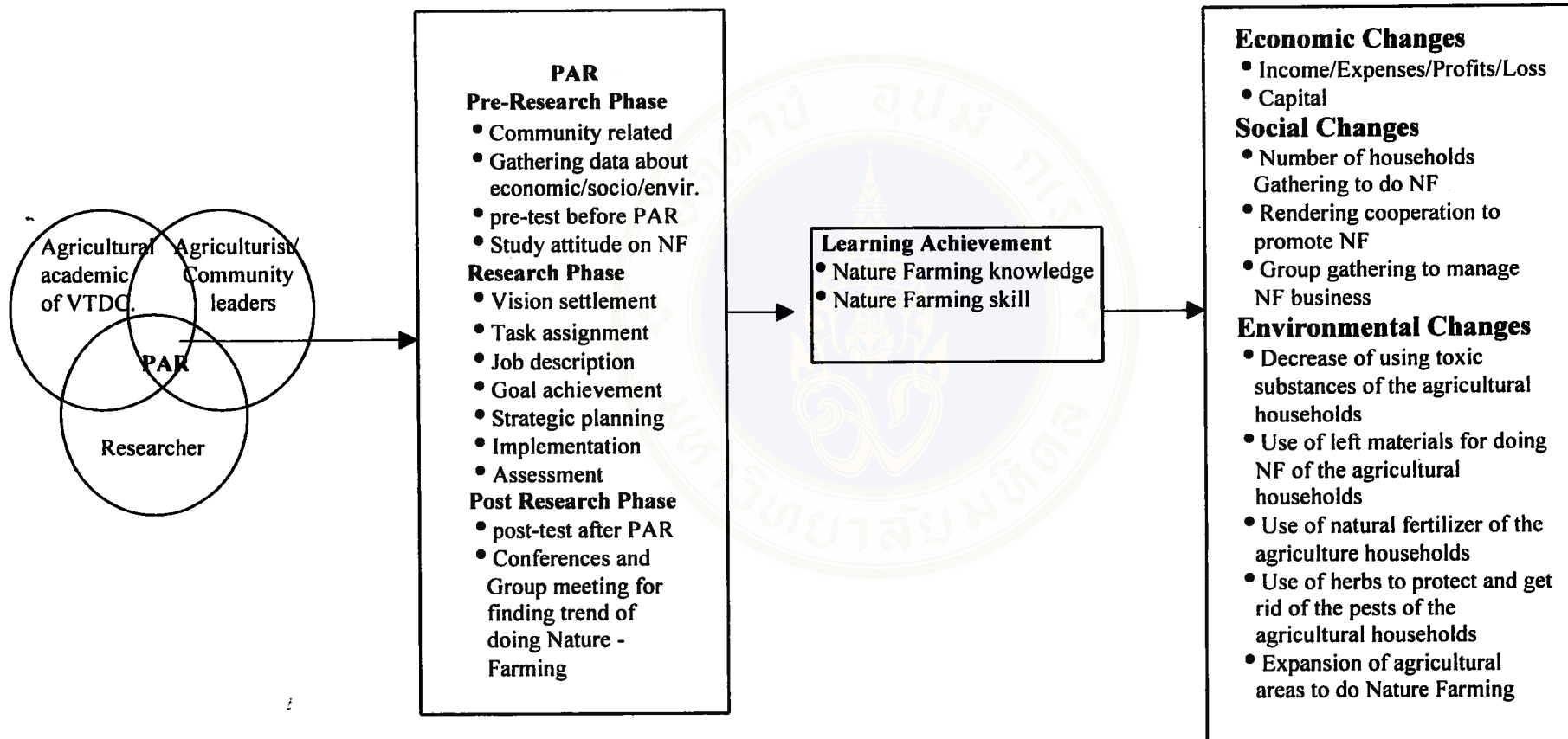
The framework and proceeding of this research were related with 3 groups of people. The first one were farmers whose join with PAR project. The second were the officials which work in the areas doing PAR .The last one was the reseacher who advices PAR methodology , the details shown in Figure 6.

#### **3.2 Population and Sample**

Population of this research were the agiculture households living along Thai-Cambodia border areas spread in 3 amphore of Sakaeo province .ie: Tapraya,Aranpratet and Klonghad . The number of all were 34,615 households . The proceeding of selecting the population and sample shown in Table 2.

##### **Step 1 Selecting the area for studying**

The researcher selected the households along Thai-Cambodia border areas in Sakaeo province by purposive sampling. These villages were important because it was the sensitive area through the secure strategy of the country. They



**Figure 6:** The Framework of Participatory Action Research on Nature Farming for Agricultural Households in Thai-Cambodia Border Areas.

<b>Amphore</b>	<b>Number of villages</b>	<b>Population</b>	<b>Households</b>
Tapraya	39	51,755	10,351
Aranpratet	34	81,609	20,402
Klonghad	8	17,378	3,862
Total	81	150,722	34,615

**Table 2** Number of Villages and Households Settled in the Self-Protection Villages along Thai-Cambodia Border Areas, Sakaeo province

**Sources :** Sakaeo provincial office (December 31, 1996)

received the affect from battle along the border areas through the war inner Cambodia. The majority of people are poor. The natural resources were destroyed. The forest resource degenerated.

### **Step 2 Selecting the Villages.**

From the step 1 the researcher selected 1 village for studying by purposive sampling with the qualifications as follows:

1. Being the border self-protection village which set up by the military authority with the aim in putting the emphasis on national stability.
- 2 .Being the village which majority people grew vegetables with its sufficient water source to do nature farming.

### **Step 3 Selecting the Sample.**

1. Selecting the farmer participated the project.

From the village in step 2 the researcher selected 30 agricultural households with the willingness to participate in activities by purposive sampling. In this regard, military, community leader, and the village committee have taken part in publicizing information and in selecting the households with the following

**Qualifications :-**

(1) Being the household which grew vegetables as its main or vice occupation.

(2) Being the household with sufficient means to perform agricultural occupation.

(3) Being the household which had never done MOA nature farming before.

(4) Being the household which have the basic factors for doing the nature farming. such as soil, water source, necessary agricultural equipments, etc.

2. The 8 key Informants and community leader were selected by purposive sampling namely a headman of village, the 7 president village committees, these are the cultural and Education side, the eradication and protection side, the security and social side, the administration side, the development side, the lady leader side, and the public health side.

3. The 8 officials working in fields selected by purposive sampling, namely a development official, agricultural official, a deputy executive the sub-district administration organization, a public health official, a commander unit specific remedy in infantryman, department, a soldier who stays in the village, a non-formal education

3.3.1.2 Measurement of learning achievement and the skill doing in side of nature farming of farmers for testing their nature farming knowledge before doing the participatory action research, the researcher used the measurement is a 15 item-pre-test to test the nature farming understanding of the farmer. These pre-tests has been checked from 3 experts, who have expertised in PAR, in nature farming and in non-formal education.

3.3.1.3 Questionnaire to study the attitudes and needs of doing nature farming of farmers by using a 15 items. These questionnaires were the Rating scale of R.A.Likert. The criterion which give the marks are follows :-

The items which are optimistic

strongly agree	give 5 marks
agree	give 4 marks
undecided	give 3 marks
disagree	give 2 marks
strongly disagree	give 1 marks

The items which are pessimistic

strongly agree	give 5 marks
agree	give 4 marks
undecided	give 3 marks
disagree	give 2 marks
strongly disagree	give 1 marks

The researcher has taken the questionnaires to 3 experts who have expertise in PAR, nature farming, and non-formal education. Checked before using. after this has been taken to try out with the 15 farmers, for finding

#### 3.3.1.4 Studies on Economic, Social and Environmental changes.

The researcher used the questionnaires for inquiring the general data of the farmers. The Economics data were namely, the main occupation, in come, the occupy land, the economizing and debt, the putting down capital of vegetable planting, the distributing production, profit-losing, and the method of distributing production. The social data were namely, social grouping, locality cooperated development, Needs of community. The environment data were namely water source for agricultural, soil nurturing, eradicate weed and insecticide, the farmers illness in community receiving chemical substances, and the using keystones from natural for agriculturing.

### 3.3.2 Research Phase

It was the period that the farmer, community leader, officer of sackers vocational training and development center and the researcher started to carry out planting the nature farming the instrument for using were following :-

#### 3.3.2.1 Focus Group Discussion and Conferences

Researcher used focus group discussion and Conferences for suggesting the team to community, the concept of project, explaining

Method of PAR, and the procedure of working together are 7 point at issue

(1) Group vision settlement

(2) Task assignment

- (3) Job description
- (4) Goal achievement
- (5) Strategic planing
- (6) Implementation
- (7) Assessment

The details are as follows:-

### **Group Vision Settlement**

Researcher use the talking meeting as the method to settle group vision for brain storming, purpose and direction of nature farming in future. The participants comprised 30 farmers participating in the project, leaders of community, Klongkaiuen Tambol Administration clerk, village-governed military officers, academics of Vocational Training and Development Center in border area Sakeo province, Volunteer teacher of the village and researcher.

### **Task Assignment**

In task assignment of group, small group meeting was the method for braining storming both general task and each section task. The participants comprised 30 farmers in the PAR project, leader of community, academics of Vocational Training and Development Center , village-governed military officers and research.

### **Job Description**

The process of brainstorming was used for job description before operation. Ideal would be consotidated to make clear understanding and small group meeting was held to find strength, weakness, opportunities and threat (S.W.O.T)

which the issues were classified into 4 groups. Each group would consider each issue; strong point of community on nature farming support, weak point of community on nature farming conduct, possibility to accomplish the project and what was going to be obstacle in the way of nature farming success. After that all the participants would discuss again in the general meeting to eliminate the repeated issues and add the imperfect issues.

### **Goal Achievement**

Goal was the direction of work, the researcher used the small group meeting as the method to create. The time period was scheduled to control work so that activities would go on as the time plan. There were processes leading to success since the operation was concrete. After each group had settled goals for implementation, the general meeting was held to discuss simultaneously on goal of working.

### **Strategic Planning**

To plan for strategy, the small group meeting was held to discuss in accordance with goal of working

### **Implementation**

Having settle goal and strategic planning, working group comprised farmers from the project, local agency officials, military officers, academics of Vocational Training and Development Center for Thai people in border area Sakaeo province and researcher cooperated to arrange plan and table of implementation for work activity in accordance with time possibility and operation would be done according to plan arranged.

### **Assessment**

In assessment of working operation, the assessors comprised representatives from 3 sections as follows;

Farmer – two of them would be selected to be assessors

Local agency officials – chief of village-governed military officers and academics from Vocational Training and Development Center

Researcher-The assessed issues were related to understanding and implementation on nature farming. The method of assessment used was authentic assessment from accumulated work portfolio and taking notice.

Focus group discussion will be the minor point at issue from the workshop. Each group will have 7-8 members. Focus group used for exchanging ideas, problem discussion and expressing opinions.

### **Concept of Focus Group Discussion**

The focus group discussion was one of the methods the researcher used in the PAR project since it was the way to know, to perceive and notice the participants reaction closely, as a result, the wanted answer would be came out. During the discussion , the researcher group could encourage all participants to interest in the same issue and to exchange their ideas among them. Another benefit was the understanding of thought, feeling, mind and behavior of participants in the group.

To hold the focus group discussion, there should be a conversation among the researcher and key informants who had quite the same economic, social, profession status or other backgrounds according to each study goal.

It was expected that this group could answer question issue the researcher had interested and could receive the best reason of answer to study purpose. Most of participants should have homogeneous backgrounds and the size of discussion group should have 7-8 members who were suitable for argument and response to the meeting with regard to discussion and talking. If the size was bigger, the conversation group might separate into small one and talk with each others themselves resulting in conclusion of question issue or data analysis.

In focus group discussion, the researcher should prepare questions for guideline on conversation, analysis on relevant problem. The duties of them were to urge, analyze situations and data for construct question issues until best answer with clear reason. This process was done by jottings down and tape recorder.

The benefit of focus group discussion was that all participants did not conceal their knowledges as they talk the same matters. The atmosphere in the group was quite relaxed so the members feel free to express their views. The researcher could make questions to find out the best answer in detail which was in accordance with study purpose. As a result, the data collected was complete, suitable for adding quantitative data and for case study or pilot study. This method of data collection was safe time and cost. The detail was quite in deep and could indicate the influence of culture and value in that society since the answers received from focus group discussion would show culture, tradition, and social value of the studied society or community

### **3.3.2.2 Portfolio**

Used for seeing the progress of the farmers' working and development in learning in nature farming

-The task was setted by group during the workshop and focus group discussion, namely the photo of the progress vegetable planting, a record form understanding the nature farming, and recorded the problem during the procedure, solving method, and the effect during to do the nature farming, and a successful record by comparing the plan and the result of procedure with the truth procedure.

### **3.3.2.3 Participant Observation**

Used by the researcher for taking participation in all nature farming developing activities of the farmers for the whole period of conducting research in order to understand the context and conditions in production, the techniques relevant to the communities, group reaction, agricultural activities relevant to promotion of community culture and tradition as well as environment by using observation recording form.

### **3.3.2.4 Non-Participant Observation**

Used for collecting data concerning economy, society, and environment of the farmers.

### **3.3.3 Post-Research Phase**

It was the last period for PAR. The team have gathered for finding the concept of result which have worked together, for evaluation the respondence and future trend of the team. The result concept will take for planning in nature farming and market for groups in the future. Instruments used are as follows:-

1. Knowledge and skills test used for post-testing participatory 30 farmers after conducting participatory action research.

2. Consultation used for work conclusion, proposing obstacles and problems, including the way to perform sustainable agricultural activities, setting aims for implementation in the long run, planning for seeking marketing channel for self-reliance in the future, investment, and comparing the original agricultural capital with nature farming. There were 3 sections which participated in focus groups. Namely 30 farmers, community leaders, officers in local development, agricultural academic from Sakaeo vocational training and development center and researcher.

### **3.4 Data Gathering**

3.4.1 Document data. The researcher collected the secondary data about sustainable agricultural development, economic, social and community environment.

3.4.2 Data gathering in the field. The researcher has gathered data through the setting plan, which used 10 months, beginning from February, 1999 to January, 2000.

### **3.5 Data Analysis**

Analysis of data will be undertaken by the following ways:

#### **3.5.1 Qualitative Data**

(1) The researcher used portfolio for collecting data on farmers' learning development and nature farming skills, including use of authentic assessment.

(2) Descriptive analysis used for analyzing qualitative data on economy, society, and environment of participatory agricultural households.

### **3.5.2 Quantitative Data**

Used for supplementary description of qualitative data as follows :-

(1) t-test and other appropriate statistics used for analyzing data on farmers' learning achievement and nature farming skills.

(2) Percentage, mean and standard deviation used for analyzing data on economy, society, and environment of agricultural house holds participating in the-project.

## CHAPTER IV

### RESULTS

These results will be divided into 3 phases, i.e. pre-research phase, research phase and post-research phase

#### 4.1 Pre-Research Phase

##### 4.1.1 Cooperating with the Leader of Community

On choosing farmer to participate in nature farming project, Researcher has entered and lived in the community and participated a wide range of activities with people until they were familiar with the researcher, then the researcher has called an official meeting with community. The purpose of the meeting is to exchange agricultural viewpoint and to explain the project. It was found that most of the people had negative attitude to government agencies and person outside community. One farmer said that

*"We have seen many government agencies come to our village. But then they disappeared Sometimes we were in debt because of them"*

*"The reason why we come to the meeting is that we don't want to disobey our bosses' orders"*

The researcher talked about the low-cost production of nature farming vegetables that most of the people interested in but didn't believe in the project. However, the leader, the development project officers and military men agreed that the project should go on.

Focus group discussion was the methodology used by the researcher for the process of choosing farmer participated in the PAR. The group participants comprised three parties, i.e. the leader of community, local government officials and the researcher.

The result of focus group discussion led to working processes as follows;

(1) Public relation

There were 2 kinds of public relation : the announcement via loudspeaker responsible by village military men and information given by house chief.

(2) Process of applying farmer to participate in PAR

Farmers interested in PAR should apply to a committee consisted of two persons; village chief and the fifth house chief (Mr.Thong Sarthpanya) appointed by the meeting. These persons, familiarized with the community, would receive the application from farmers

(3) Selection process

There was a judging-committee comprised three parties, i.e. the representative of the local development project officers, the people and the researcher.

In short, this committee was as follows;

- village-governed military men
- agricultural academics of vocational training and development center
- village chief of Tubtim Siam 05 project
- president of village committee
- researcher

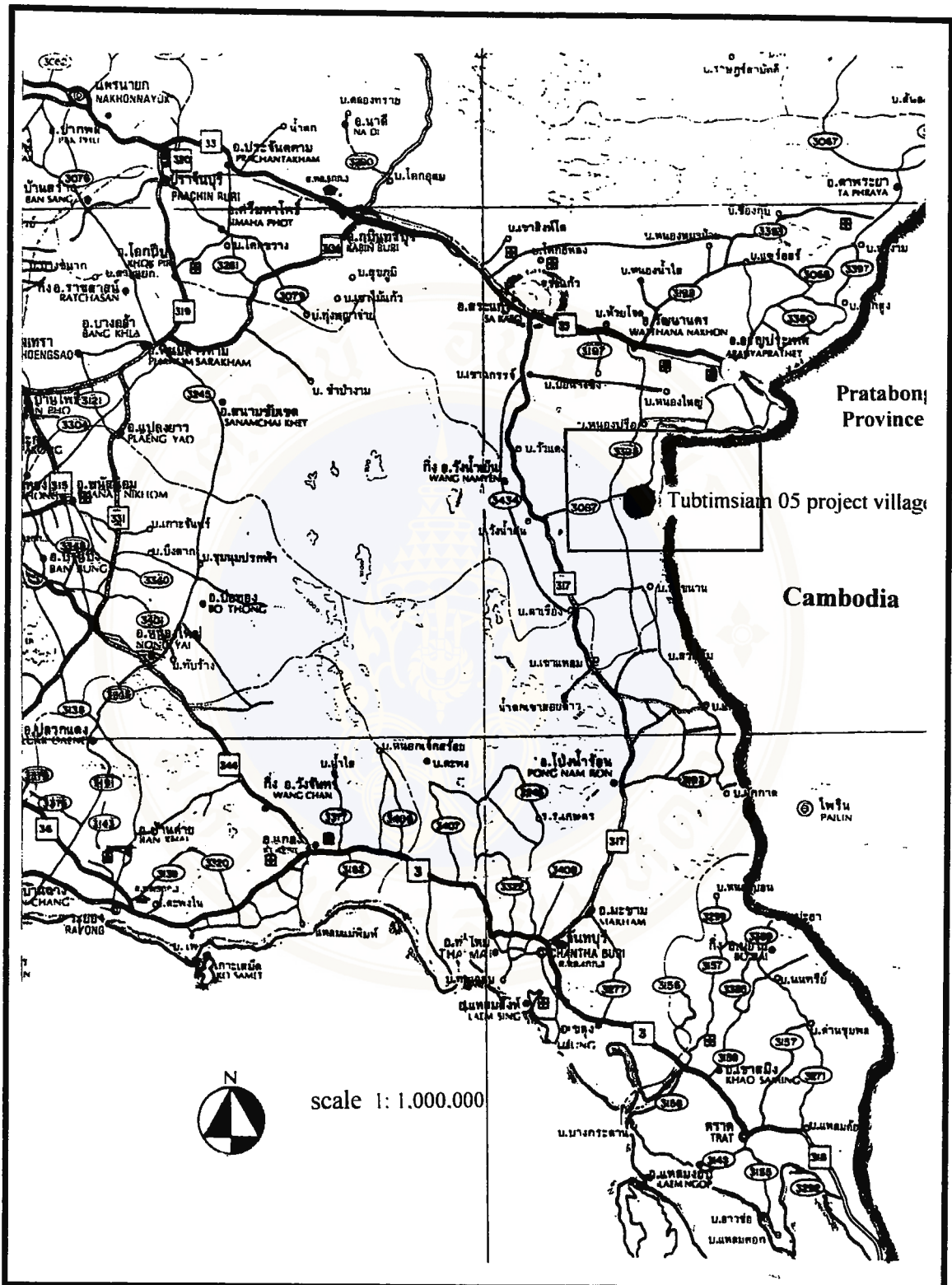


Figure 7 The Map of Thai- Cambodia Border Areas

Farmers qualified for the PAR project were chosen by the judging committee. The qualifications of this project were as follows;

- must be head of the family
- wife or member in the family was at the age of 15 years old or over.
- growing vegetables as a main profession or secondary profession
- minimum of 10 rai land to fill a farm for a living
- farm land near source of water
- having basic equipment for agriculture such as water pump, hoe, shovel etc.

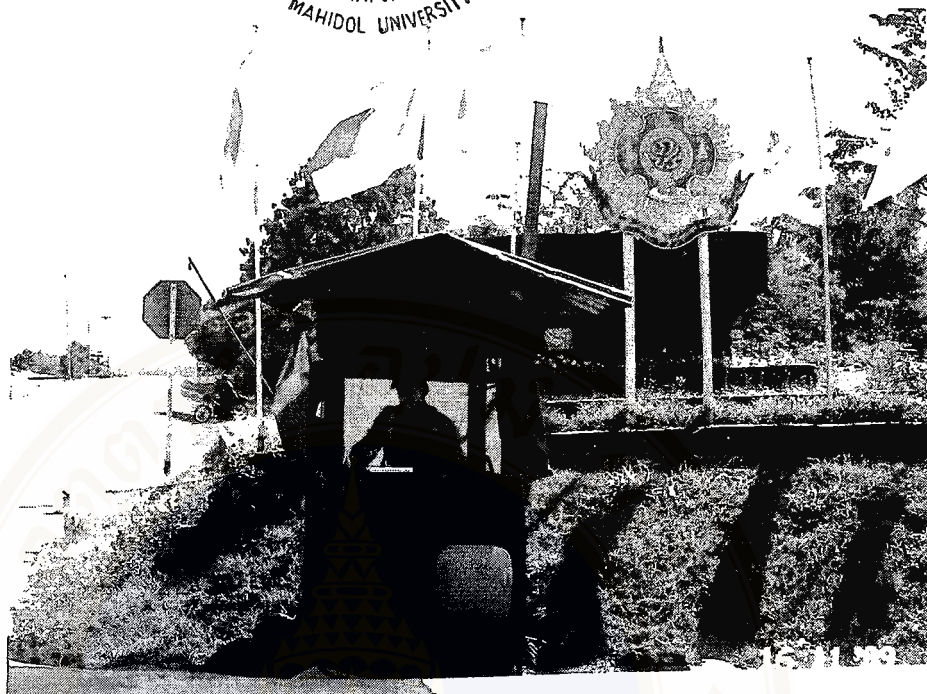
At last, the committee has chosen 30 farmers to participate in the PAR project

#### **4.1.2 General Background of Studied Communities**

The details of history and economic, social and environment background of the community are as follow;

##### **4.1.2.1 History and Physical Environment of Reaearch Community**

The community was at the level of village, aka Tubtim Siam 05 project village. It was established by Her Royal Highness Princess Chulaporn, the president of Chulaporn Research Institution. Her Royal Highness acknowledged the plight of Thai-Cambodia border Sakaeo province people as the impact of internal war in Cambodia. The way of their lives were in danger so the economic, social and administrative development in this area were in crisis. Therefore, Her Royal Highness



**Picture 1** The Military Official of Tubtim-Siam 05 Project Village, whose Take Care and Protected Security for People in the Village.

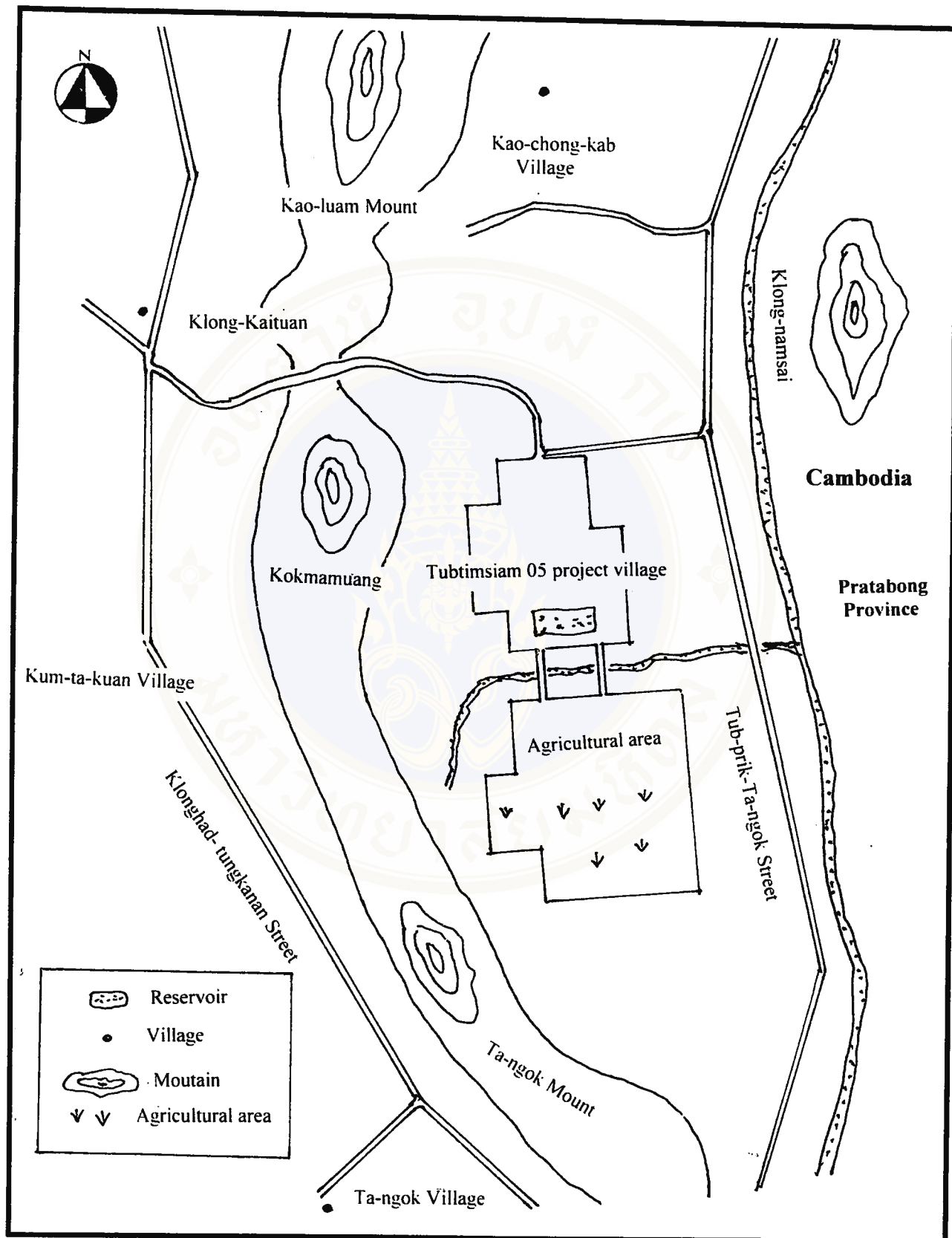


**Picture 2** The Office of Village Govern Military in Tubtim-Siam 05 Project Village Tambol Klong Kaituan .Amphore Klonghad, Sakaeo Province.

has initiated the rehabilitation center for Cambodia people project. The purpose of this project was to develop environment and quality of lives for the people near Thai-Cambodia border at Sakaeo province, the center of development. The project was led to self-defence villages along the Thai-Cambodia border by way of sustainable solving problems. To achieve this, The Forestry Department has given permission to Chulaporn Research Institute on 6 October 1994 for using the National Forest, Kao Chakan-Nonsao-eh forest at Klonghad district. The type of forest is degraded forest land. It was distributed as farming land and dwelling places to the Tub Tim Siam 05 people. There are 150 people in the project who were given right to farming. (Royal Forest Department, 1997:1)

The Tub Tim Siam 05 project village was located near Thai-Cambodia border, at the area of Kokmamuang Mount, Klongkaiteun sub-district, Klonghad district, Sakaeo province. Klongnamsai canal was the border line. The size of village was about 9,960 rai In the old days, the land was degraded forest because the people had encroached on national forest and had grown crops such as sugar-cane, corn and cassava. The boundaries of this village were as follows; (Department of Land Development, 1994 : 1-2)

- |       |  |
|-------|--|
| north | - degraded forest plain.               |
| south | - Ta-ngok Mount and Klongnamsai canal  |
| east  | - Cambodia border (Pratabong Province) |
| west  | - Kokmamuang ridge Ta-ngok mount       |



**Figure 8** The Tubtim-Siam 05 Project Village. Tambol Klong-Kaituan Amphore

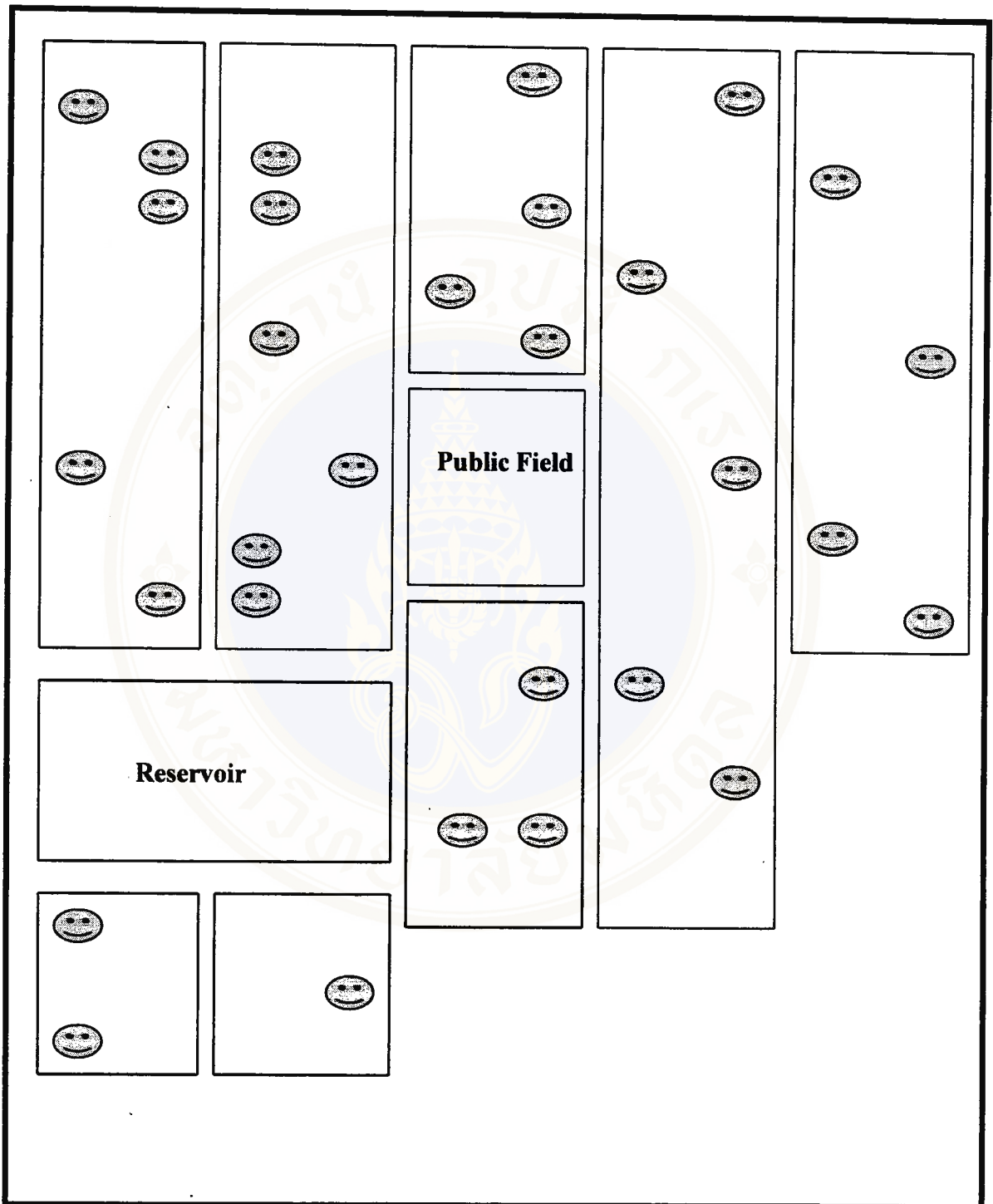
Klonghad, Sakaeo Province



**Picture 3** The Deciduous Forest Along Thai-Cambodia Border Areas Encroached by People for Growing Farm.



**Picture 4** Many Kinds of Natural Material in Community ,ie; Sugar Can , Corn and Cassava, which Farmers never Use for Soil Improvement.



**Remark** ☺ = Participated Farmers' Household

**Figure 9** Distribution of Farmers' Household in Participatory Action Research Tubtim-Siam 05 Project Village, Tambol Klong-Kaituan Amphore Klonghad, Sakaeo Province

The village area looked almost like flat land. Some areas were undulating hills with the 2-5% slope. Agricultural land of villagers were plain. The soil was wet and humid during rainy season. The water way flowed along village area was Klongnam-sai canal. This canal was the border line between Thailand and Cambodia. At the east of area, there was water way flow all year round and in the middle of village, there was a creek flowing through it.

The researcher has made a farmer house chart on the purpose to see how their houses were located. Then, the chart was presented to village chief for correction and approval.

#### **4.1.2.2 Social Structure**

##### **(1) Population**

There were 596 people in the village which can be grouped into 139 family houses, 300 male and 296 female. It was found that 70 percents of the villagers had moved from Nakornsawan province, 20 percents from Nakornrachasima and Konkhaen province, 10 percents was klonghad district, Sakaeo province people and from other places. (Division of the Eastern army Troop, 1999 : 2)

##### **(2) Village Governing System**

Under the village governing system, the leaders of community were selected to be a village committee. The committee comprised 23 people : the president of village committee, vice president, secretary, treasurer and 7 other division members such as suppression & prevention, culture & education, social welfare, administrative, public health, female leader and development division.

Each division was the representative of villager and had a duty to coordinate with other government agencies about activities promotion in the village. The committee was elected and held office for a term of 1 year. In addition, the village was divided into 7 housed-groups, aka "Koom". Each Koom has a chief, assistant chief and secretary.

### **(3) Temple and Educational Institution**

No temple, aka "Wat" and religious building in the village according to regulation of establishment issued by military force. People had to make merit and conduct religious ritual at WAT Klongkaiteun Situated 10 kilometers away. However, there was one small primary school. It had 7 rooms, 124 students : 61 male, 63 female and 8 teachers. Most of villagers had primary and external education background. Some had secondary background. The detail were as follow; (Division of the Eastern army Troop; 1999 : 2)

primary school (Pratom 1-6)	130 people
secondary school (Mattayom 1-6)	40 people
external education	60 people

### **(4) Social Group**

Most of social groups in the village were formed by government agencies with the purpose to develop occupation to members of society. Now, there were 10 main groups as shown in Table 3.

**Table 3** Social Groups in Tubtim Siam 05 Project Village .Tambol Klong-Kaituan  
Amphore Klonghad . Sakaeo province.

Social Group	Total of Member	Year of Establishment	Established by
1. farmer wives	30	1996	Community Development official
2. Sweet black soy group	30	1996	Community Development official
3. Muchroom planting group	16	1996	Training and Vocational Development
4. Kitchen garden Veg group	10	1998	Community Development official
5. Rice Bank	4	1996	Community Development official
6. Chicken raising	10	1998	Community Development official
7. Cow raising	8	1999	Community Development official
8. Marketing Demonstration group	65	1997	Agricultural Community Development official
9. Money Saving group	53	1998	Community Development official
10. Saving cooperative group	96	1997	District cooperative official

### 4.1.2.3 Economic Background

#### (1) Population Income

In 1999 the community development office has surveyed basic needs of family house in Tubtim Siam 05 project village. It was found that the average in come per family is 14, 600 bath per year nearly 14, 669 bath of Klonghad district people (Sakaeo province office, 1998 : 6) However, the information obtained from the village-governed military men and the community development official indicated that most of villagers were in debt to capitalists and middle man merchants in that area because they had borrowed money to invest in agriculture. Under the condition of loan agreement, the debtors were obliged to repay their crop products with 5% interest rate per month. The crop products during the year of 1998-1999 and crop price were shown in Table 4

**Table 4** Kind of crop products and price sold between 1998-1999

Kind	Product/rai (kg)	Price/1 kg	Period of growing (day)
Soy Bean	280	10	90
Green Pea	100	12	60
Cotton	150	16	90
Sunflower	90	9	60
Corn	1,200	2.60	90

## **(2) Farming Occupation**

Most of the economic plant were farming products. The vast majority of crop grown were corn, soybean, millet, cotton, sunflower and cassava. During the period of one year, farmers could grow crop two times a year as follows:

Phase 1- growing corn took 90 days

Phase 2- Four or five sorts of crop were chosen to be grown, depending on crop price, such as soybean taken 90 days of growing, cotton 90 days of growing, green pea 60 days of growing and sunflower 60 day of growing.

However, in 1999 most of farmers grew soybean in phase 2 and lost profit because of heavy rain during harvest period. Moreover, some farmers grew vegetable and mushrooms. The others raised Livestock : chicken, ducks and cow. The period of farming occupations in the village were shown in Table 5 .

### **4.1.2.4 Village Resources**

The main resources of the village were as follow :

#### **(1) Water Resource**

Klongnamsai canal border line between Thai and Combodia, and a creek flowing through the village were the important water resources. Eventhough the quality of water was clear but there was the calcium carbonate the residue floating at the surface having pH 7.5-8.4 There was Algae all around. The quality of water was no harm to fish breeding but it could not be consumed as it was hard water. Therefore, villager had to depend on rain water for consumption and main farming (Sakaeo Provincial Office 1994 : 2)

**Table 5** The Period of Farming Occupations in the Tubtim Siam 05 Project Village,  
Tambol Klong Kaituan Amphore Klonghad,Sakaeo province.

Farming Occupation		Month											
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOU	DEC
1	Corn			←→					←→				
2	Soybean								←→				
3	Green Pea								←→				
4	Millet										←→		→
5	Sunflower										←→		
6	Cotton								←→				
7	Chicken Raising	←											→
8	Duck Raising	←											→
9	Cow Raising	←											→
10	Mushroom									←→			→
11	Veg Garden	→										←	

Although there was natural water resource, called “Klongnamsub” canal : winding canal with the size of 6-12 meters width and 5-15 meters depth and the 2 kilometers length to Cambodia border, it was not enough for agriculture. Farmer had to depend on water resources dug by government agencies such as 6 underground water wells, 15 shallow water wells with the 3.50 meters depth, 15 ponds and the ditch dug by military force with the 2-5 meters width and 1 meter depth flowing through farm land.

## **(2) Forest Resource**

The area of Tubtim Siam 05 project village was situated in Kaochakan-Non sao-eh National park. The condition of forest was degraded forest land encroached by people for growing sugar cane, corn and cassava. At the northwest and southeast of the village were deciduous forest. The precious woods in this area were *Lagerstroemia*, and *Dalbergia*. However, they were cut down and left only *Lagerstroemia* and few main woods.

## **(3) Soil Resource**

The soil in the village comprised three types of soil : *Tubprik ( TPK )* -deep soil, *Bungchanung ( BOG )*-shallow soil and *Tubkwang ( TW )*-mixture of stone and soil. The type of these soil had description as follows :

**Tubprik Soil ( TPK )** : most area of the village had this type. It consisted of residuum, colluvium, shale and limestone on flat land area to undulating area at a slope of 2-5% It was soil found at more than 1.5 meters deep level. The flow of water run at the middle level of soil surface. The absorption through lower soil was quite slow : the coefficient of absorption was 0.02 centimeter per hour. Since the

absorption of soil at the surface was quick, there was a swelled soil problem at the top level. That led to no water could absorb through lower soil. Soil would be wet and air could not ventilate so the roots of tree stopped growing. In rainy season, the cultivation was quite ineffective. TPK soil had no strong potentiality for growing seasonal plant and perennial plant. Although the soil was quite fertile-only lack of phosphorus, it had wet soil problem as the lower soil absorbed slowly. Consequently, it was necessary for agriculture to have surface soil draining system management in vegetable plot or underground system of pipes or applying growing method by making soil into termite hill shape for growing perennial plant to prevent wet soil because it had poor ventilation that roots of trees could not spread out.

**Bungchanung Soil (BOG)** : It was found only in a narrow place in the village next to Kokmamuang-Ta-ngok Mount. It consisted of residuum, colluvium rock of shale, limestone and conglomerate on the flat land area to undulating area at a slope of 3-5% It was shallow level soil : 50-100 centimeters soil level. The drainage was good but the absorption was quite slow. The upper soil at the level of 0-20/30 centimeters was a mixture of clay and sandy soil with a lot of organic compounds. The absorption was quick. There were fertile mineral resources except phosphorus.

The lower level soil (20/30-50 centimeters) was a mixture of clay and sandy soil with less organic compounds. The absorption was quick. It lacked phosphorus.

The lowest level soil (marl : 50-70 centimeters) consisted of secondary lime concretion and smaller amount of clay. It was quite delicate, unstable and could be

dissolved in water. The water absorbed through quickly and formed underground waterways. This caused a leak problem once the well and reservoir had been made.

The growing potentiality of Bog soil was quite the same as TPK soil in that it was at the middle level. Growing perennial plants should arrange for drainage system out of root parts of the tree. Whereas growing seasonal plants should drain water out of vegetable plots and high level of phosphate fertilizer was needed.

**Tubkwang Soil (TW)** It was found in narrow place together with TPK soil. It consisted of residuum, colluvium shale and limestone on eroded soil surface. It was 1 meter deep soil. Drainage was good as this soil comprised pieces of conglomerate. The area was undulating with 2-3% depth. Water could flow at the middle level.

The upper level (0-20 centimeters) was sandy soil with pieces of shale and conglomerate. The absorption is quick. The fertile soil had a lot of organic compounds except Phosphorus

The lower level (30 cm.) was quite the same as the upper one : it lacked Nitrogen and Phosphorus

In short, soil had high potentiality for growing perennial plant, a variety of fruits such as durain, rambutan, mangosteen, jack-fruit etc. because of good drainage and high potentiality, too, for growing soybean, green pea, corn, sugar cane etc.

#### **4.1.3 General Data of Studied Farmer Households**

##### **4.1.3.1 General Background**

Farmers in this project were selected from 139 farmer households in Tubtim Siam 05 project village. Thirty farmer household were chosen only one person.

Therefore, 30 farmers : 19 males and 11 females were in the project. General background were as follows :

### **(1) Age and Education**

Most of farmers at the age ranging from 31-40 years were equivalent to 46.7% Whereas farmers at the age below 30 were 36.7% and at the age over 40 were 16.6%

As regards education level, most of them had primary school level which were equivalent to 56.7% It was confirmed that people who worked as farmers still be the low-educated group. Therefore, agricultural knowledge development was needed for their basic occupation.

### **(2) Family Status**

Most of them were chief of family or wives equivalent to 73.3% The people who had no land to do for a living were selected by Military agencies to settle down with 10 rai of land allocation per family for farming. With regard to marriage status, they were married equivalent to 73.3%

### **(3) Total of Members and Labours in the Family**

Most of family had 4-5 members, males and females were quite the same proportion and the total of labours in the farmer family were 1-2 person, that is 46.7% (Table 6).

#### **4.1.3.2 Economic Background**

To obtain economic status, the researcher has divided the study into many issues, ie main occupation, income, expenses per year, money savings & debt, ability to repay debt, investment of agriculture, land holding, sales of farming

products, price satisfaction of last year. Another data relating to growing vegetable, ie appropriate time for growing, total of cultivated area, sort of vegetables grown, cost, profit and sales of vegetables.

### (1) Main Occupation

It was found that all of the participants were farmers equivalent to 100 %

**Table 6** Number and Percentage of the Studied Group divided by Sex, Age, Education Level and Family Status.

General Data of Farmers	Number (30)	Percentage (100)	Mean	Standard deviation
<b>Sex</b>				
male	19	63.3		
female	11	36.7		
<b>Age</b>			30.23	5.09
30 years & below	11	36.7		
31-40 years	14	46.7		
41 years & over	5	16.6		
<b>Education Level</b>				
primary school	5	16.7		
secondary school	17	56.7		
higher than secondary school	8	26.6		
<b>Family Status</b>				
head/wives	22	73.3		
member	8	26.7		

General Data of Farmers	Number (30)	Percentage (100)	Mean	Standard deviation
single	8	26.7		
Married	22	73.3		
<b>Total of Member in Family</b>			4.87	1.59
male			2.27	0.98
female			2.60	1.38
<b>Total of Labour in Family</b>				
1-2 persons	4	46.7		
3-4 persons	11	36.7		
5 persons & over	5	16.6		

## (2) Income and Money Saving.

The average income of farmers before deducting costs was 53,464.33 baht per year compared with Klonghad district people in 1999, it was found that farmers in the project has slightly lower average income than Klonghad district people's income : 58,676 baht per year. However, the average income of Sakaeo province people was 149,332 baht per year, higher than of farmers in the project.

However, the average income of farmers after cost subtraction was 8,285.67 baht per family.

As regards money savings per year, 46.7% of farmers had no savings and 60% of them were in debt. The average debt was 11,100 baht per family per year whereas the ability to repay a debt was average 8,034.37 baht per year. It could be

explained that most of them had enough income to cover their expenses. Because of their savings, they could repay some debt. From the data it was found that some farmers had borrowed money from capitalists or banks and had to repay interest. As regards high rate and monthly interest, farmers had to pay very high rate of interest and interest for default or crop-product interest. Some years, there was a drought that damaged the harvest so the farmers ran into huge debts.

**Table 7** Number and Percentage of Farmers in the Project Classified by Occupation and Income

Economic character	Number (30)	Percentage (100)	Mean	Standard deviation
<b>Main Occupation</b>				
Growing Rice	-	-		
Do Farming (farmer)	30	100		
Do Gardening	-	-		
Others	-	-		
<b>Money Savings Per Year</b>			1,502.00	2,951.56
Savings	14	46.7		
No Savings	16	53.3		
<b>Debt Per Year</b>			11,100.00	12,056.29
Ran into Debt	18	60.0		
No Debt	12	40.0		
<b>Ability to Debt Repayment Per Year</b>			8,034.37	5,463.22

### 4.1.3.3 Vegetable Growing

#### (1) Experience of Growing Vegetables.

The information obtained from the study were as follows : period of growing vegetable in the old days, total of vegetable growing area, purpose of growing, total of growing time in one year, period of growing in each phase, appropriate period for growing vegetable and period of the highest selling price. It was found that most of the farmers had 1-3 year experience of growing vegetable : average 2 years. Vegetable growing land were under 1 rai which complied with the purpose of growing vegetable in terms of growing for consumption. As 70% of farmers answered that the purpose of growing was for consumption, there was no need to have a lot of landholding. Whereas 30% of them grew vegetable for sale. The average of growing land was 1.21 rai and farmer who had 8 rai was the biggest holder of landholding. The favorite sort of vegetables to grow for sale were *kale*, *chinese cabbage*, *chinese mustard*, *egg plant* and *long-egg plant*. All vegetables were sold at low prices : approximately 1-2 baht per kg.

As regards the period of vegetable growing all year round, Most of the farmers equivalent to 43.3% told that they had grown vegetables for only one time. It took mostly 1-2 month at a time to harvest product as the kind of crops were short-life and medium-life vegetables. Moreover, it was found that most of the farmers equivalent to 73.3% answered that winter is the most appropriate season for growing. However, summer is the period of best selling price. Whereas rainy season and winter were the season of better and worst selling price respectively.

## (2) Price Satisfaction and Sales of Farming Products

Most of the farmers equivalent to 76.7% did not make a profit from selling vegetables but only 23.3% of them did. However, they had a profit of 1,423.33 baht from selling vegetables last year and the one who gained the biggest profit could get 26,240 baht per year from growing egg plants within area of 8 rais. Whereas the one who made lowest profit from long-egg plants grown in area of one (1) ngan and made a profit of 300 baht per year. However, the majority of farmers answered that no profit was gained from selling vegetables but they could eat their own vegetables to reduce their expenses 5 indirectly in the family.

**Table 8** Number and Percentage of the Samples Group Relating to Vegetable Growing Experience.

General Data of Farmers	Number (30)	Percentage (100)	Mean	Standard Deviation
<b>Experience of Growing Vegetable</b>			2.00	2.008
1-3 years	25	83.4		
4-6 years	4	13.3		
more than 6 years	1	3.3		
<b>Total of Growing Areas</b>			1.21	1.01
below 1 rai	22	73.3		
1-3 rai	5	16.7		
4-6 rai	2	6.7		
more than 6 rai	1	3.3		

General Data of Farmers	Number (30)	Percentage (100)	Mean	Standard Deviation
<b>Purpose for Growing</b>				
consumption	21	70.0		
selling	9	30.0		
<b>Total of Growing/Year</b>				
1 time	13	43.3		
2 times	8	26.7		
3 times	9	30.0		
<b>Period of Growing</b>				
1-2 months	21	70.0		
3-4 months	9	30.0		
<b>Appropriate Time for Growing</b>				
summer (Mar - May)	-	-		
rainy season (Jun – Oct)	8	26.7		
winter (Nov – Feb)	22	73.3		
<b>Period of Best Sales Price</b>				
summer (Mar – May)	15	50.0		
rainy season (Jun – Oct)	12	40.0		
winter (Nov - Feb)	3	10.0		

As regards methods of selling vegetable products, it was found that 50% of farmers had not sold their products but only consumed within their family or gave them to their neighbors. Whereas 36.7% of farmers sold their crops to middleman

who came to buy vegetables in the village. Only few farmers sold by themselves in local market. Nevertheless, when asked about price satisfaction from selling crop products, 80% of them answered that they were not satisfied with the price. The alternative way was that they preferred to sell their vegetables to middleman who came to the village. Although the sale price was quite low, it was more convenient to sell this way. It was noted that no sales or purchase crop products were made by social group formed by people in the village, such as cooperative groups or representatives of the villagers (Table 9).

**Table 9** Number and Percentage of the Samples Classified by Methods of Sales

General data of farmers	Number (30)	Percentage (100)	Mean	Standard Deviation
<b>Profit from selling all year round</b>			1,426.33	5,045.17
No profit	23	76.7		
Made profit	7	23.3		
<b>Price Satisfaction</b>				
Not satisfied	24	80.0		
Satisfied	6	20.0		
<b>Methods of Selling</b>				
Middleman come to buy it in- the village	11	36.7		
Sell by them selves in the local- market	4	13.3		

General data of farmers	Number (30)	Percentage (100)	Mean	Standard Deviation
Villagers bought it	-	-		
Social Group bought it				
Cooperative group bought it	-	-		
No sell (self consume)	15	50.0		

**4.1.3.4 Social Background of Farmers Participating in the PAR Project**

As regards the social group, the researcher had studied the following data : the member of social group, the cooperation in local development, the study of problems and demand for community. It was found that most of them equivalent to 93.3% were members of saving cooperative. Another member groups were marketing demonstration group which was 66.7%, money saving group and mushroom planting group respectively. It was noted that the smallest member group were cow and chicken raising group because it was probable that they had just established.

**Table 10** Number and Percentage of Farmers Classified by the Member of Group in Community

Name of Group	Number (30)	Percentage (100)
<b>Farmer wife Group</b>		
member	9	30.0
non-member	21	70.0

Name of Group	Number (30)	Percentage (100)
<b>Sweet Black Soy Group</b>		
member	9	30.0
non-member	21	70.0
<b>Mushroom Planting Group</b>		
member	16	53.3
non-member	14	46.7
<b>Kitchen Garden Veg Group</b>		
member	10	33.3
non-member	20	66.7
<b>Rice Bank Group</b>		
member	11	36.7
non-member	19	63.3
<b>Chicken Raising Group</b>		
member	5	16.7
non-member	25	83.3
<b>Cow Raising Group</b>		
member	4	13.3
non-member	26	86.7
<b>Marketing Demonstration Group</b>		
member	20	66.7
non-member	10	33.3

Name of Group	Number (30)	Percentage (100)
<b>Money Saving Group</b>		
member	17	56.7
non-member	13	43.3
<b>Saving Cooperative Group</b>		
member	28	93.3
non-member	2	6.7

As regards the cooperation in local development and the need of farmers, it was found that all of farmers participating in PAR project had cooperated in developing their community in response to rural area living condition which had close relations and helped each other among members in the community. The method which they worked together in the area were donations to development activities, public holiday activities, forest planting and taking part in training courses (Table 11)

**Table 11** Number and Percentage of Farmers Classified by Cooperation in Local Development

Description	Number (30)	Percentage (100)
<b>Cooperation in local development of farmers last year</b>		
* used to cooperate	30	100
* never cooperate	-	-

As regards farmers' demands, it could be divided into many categories; risen income demand, ie low interest rate loan demand, sideline job demand, water resources demand, crop product market demand, seed embryo demand, demand that government agencies coming to develop non-fertile basin into fertile basin. The other demands were social demand and mental security demand such as requirement to have temple in the village, more mental development to villager demand.

#### **4.1.3.5 Environmental Background of Farmers in the PAR Project**

##### **(1) Landholding**

All of the farmers had 10 rai of land holding per family. The land was allocated from the military agency. Furthermore, there was another 1 rai per family for dwelling and growing vegetable too. Nevertheless, five farmers had leased additional land from military agency at the rate of 100 baht per year but that land was far away from water resources so the land was suitable only for growing crops purpose.

##### **(2) Water Resources for Growing Vegetable**

Rain water was the principal water resource for farming. The others were water from ponds, river, creek, tap water and underground water wells respectively. However, some farmers answered the questionnaires that they did not have enough water for farming. The others answered that they had enough. This was because some had their land near water resources, the others did not have theirs near water resources and had to depend on natural water, such as rain water, well water or river. This caused water shortage in summer as natural water resources had enough water during rainy season and it was dry during summer (Table 12).

**(3) Land Improvement and Use of Chemicals for Farming**

Most of the farmers (40%) answered that they used chemical fertilizer for land improvement. Whereas 33.4% of them used both ways.

Another 23.3% of them used natural material and organic fertilizer.

Moreover, most of them (80%) use chemicals for stopping weed and pest insect.

**Table 12** Number and Percentage of Farmers Classified by Sufficient Water Resources

Water Resources	Number (30)	Percentage (100)
<b>Sufficient Water Resources for Farming</b>		
enough water	15	50.0
not enough water	15	50.0

As regards the effect of toxic chemicals, it was found that 70% of members of farmers in the family had ever suffered from toxic chemicals. However, all things considered, the data revealed that 50% of villagers had got toxic from agriculture. The symptoms found were dizzy, nausea, vomit, visual illusion, rash, heart burn, unable to breath, tired and unconscious.

Considering the average of the use of toxic chemical in agriculture, It was found that farmers had had 5 years experience to use them with the average quantity of 21 kilograms and the average cost of 2,456 baht per year. Most of the

chemicals comprised herbicide and insecticide which could be bought in the local market. The famous brand names were as follow: *Azodrin, Furadan, Polidon, Gramoxon, Mataron, Paraquat, Oxa, Teodan, Alsadrin, Aliate, Graifosate, Daime* etc. (Table 13).

**Table 13** Number and Percentage of Studied Farmer Group Classified by Use of Chemicals in Farming

Method of Soil Improvement and Pest Control	Number (30)	Percentage (100)	Mean	Standard Deviation
<b>Method of soil improvement for growing vegetable</b>				
* use of chemical fertilizer	12	40.0		
* use of organic fertilizer	7	23.3		
* use both way	10	33.4		
* no use both way	1	3.3		
<b>Method of pest control</b>				
* natural way	6	20.0		
* use of chemical	24	80.0		
<b>Period of use</b>			5.00	2.12
<b>Cost of pest control chemical</b>			2,456	784.17
<b>Use of agricultural toxic quantity (kg/year)</b>			21.00	18.34

Method of Soil Improvement and Pest Control	Number (30)	Percentage (100)	Mean	Standard Deviation
<b>Agricultural Toxic Suffer</b>				
* member of family used	6	20.0		
* to suffer	-	-		
* Never suffer	24	80.0		
<b>Knowing Experience of Seeing Villager Suffered from Agricultural Toxic</b>				
* have seen	15	50.0		
* never seen	15	50.0		

**(4) Use of Natural Material in Community for Soil Improvement.**

Most of farmers didn't use material waste from nature for soil improvement, such as straw, cob and bagasse. Only soybean skin were used which were 70% of use and more than half of farmers used animal droppings in farming. Methods used were ploughing, soil-mixing and soil-covering (Table 14).

**4.1.4 Farmer's Attitude Towards Vegetable Consumption**

As regards the attitude towards the safety of the vegetable consumption now and the need for nature farming knowledge before research. It was found that farmers had the following attitudes :

**Table14** Number and Percentage of Studied Farmers Classified by Method of Natural Material Use for Soil Improvement

List of Natural Material	Number (30)	Percentage (100)
<b>Straw</b>		
no use	25	83.3
use	5	16.7
<b>Cob</b>		
no use	21	70.0
use	9	30.0
<b>Bagasse</b>		
no use	29	96.7
use	1	3.3
<b>Dropping</b>		
no use	14	46.7
use	16	53.3
<b>Soybean Skin</b>		
no use	9	30.3
use	21	70.0

The need for nature farming knowledge - 86.7% of them wanted to know vegetable growing techniques and whereas 43.3% wanted to use nature farming methods with their own lands.

Economic attitude-they had positive attitude to the cost of decomposed fertilizer comparing with the cost of chemical fertilizer that 56.7% of them did not believe that the cost of the former was higher and more complicate than the latter. However, most of them (70%) had negative attitude that use of chemical fertilizer was more convenient and more productive than organic fertilizer use. As regards the sale price, 90% of them agreed that they could not sell their nature farming products at high prices and did not believe that growing by nature farming method could make them sell product at high price.

Society and social aggregation - It was found that 70% of them agreed that the government agencies should help promote knowledge of nature farming and 60% thought that villager growing nature farming vegetable in Tubtim Siam 05 project village should group together. However, 50% were not sure that the PAR project would be the starting point to change farming method in the village.

Environmental attitude - It could be divided into 2 issues; health safety of farmers and member in the family and attitude towards organic fertilizer.

It was found that they had positive attitude towards health safety about nature farming product consumption. 90% of them agreed to pay more to buy toxic-free vegetable for eating and 83.3% agreed that eating nature farming vegetables would make their members of the family healthier. In addition, 73.3% of them thought that vegetables sold in common market were not safe to eat. 66.7% were not sure whether to buy it from the common market when the seller explained that it was non-toxic vegetable.

As regards whether or not organic fertilizer could substitute chemical fertilizer, 60% of them agreed that it could substitute with the same quality but they were not sure that nature farming could increase more productivity at the rate of 60%

All in all when everything was considered, Most of them still had positive attitude to nature farming on the need for this knowledge, social aggregated promotion and healthy assurance to consumer. However, considering economic attitude, it was found that most of them had negative attitude towards the price of nature farming products they had sold. Therefore, 86.7% of them were not sure whether or not to pursue their nature farming method after the PAR project was finished (Table 15).

**Table 15** Attitudes Towards Nature Farming Methods in the PAR Project

Contents	Attitude Percentage/(Total)					Mode
	Strongly agree	Agree	Un decided	Dis agree	Strongly disagree	
1. It is safe to consume vegetable sold in the market. *	-	-	10.0	16.7	73.3	strongly disagree
2. When you bought vegetable in the market, would you believe that it is true when they tell you that it is toxic-free vegetable ?	6.7 (2)	16.7 (5)	66.7 (20)	10.0 (3)	-	udecided
3. You are willing to pay more for buying toxic-free vegetable	10.0 (3)	90.0 (27)	-	-	-	agree
4. It is necessary to use insecticide for growing vegetable. *	13.4 (4)	63.4 (19)	16.7 (5)	6.7 (2)	-	agree

Contents	Attitude percentage/(total)					Mode
	Strongly agree	Agree	Un decided	Dis agree	Strongly disagree	
5. Decompose organic waste can replace chemical fertilizer and have the same quality	10.0 (3)	60.0 (18)	10.0 (3)	20.0 (6)	-	agree
6. Chemical fertilizer is more convenient than the natural one and gives more productivity. *	-	70.0 (21)	20.0 (6)	6.7 (2)	3.3 (1)	agree
7. The cost of making decomposed fertilizer is higher than the chemical one and more complicated. *	-	33.3 (10)	10.0 (3)	56.7 (17)	-	disagree
8. Eating nature farming vegetable makes your members of family more healthy	83.3 (25)	10.0 (3)	100 (2)	-	-	strongly agree
9. You want government agencies to help promote nature farming methods.	70.0 (21)	20.0 (6)	10.0 (3)	-	-	agree
10. You want knowledge of nature farming vegetable growing	13.4 (4)	86.7 (26)				agree
11. You are sure that nature farming can increase more productivity	6.7 (2)	26.6 (8)	60.0 (18)	6.7 (2)	-	undecided

Contents	Attitude percentage/(total)					Mode
	Strongly agree	Agree	Un decided	Dis agree	Strongly disagree	
12. You want to use nature farming method in your farm land	13.4 (4)	43.3 (13)	26.6 (8)	16.7 (5)	-	agree
13. Vegetable growing by nature farming method may not develop as highly as chemical fertilizer did. *	20.0 (6)	26.7 (8)	40.0 (12)	13.3 (4)	-	undecided
14. The price of nature farming product is not high in the local market negative question	90.0 (27)	6.7 (2)	3.3 (1)	-	-	agree
15. You are afraid that the price of your product will not baas high if you grow vegetables by nature farming method. *	6.7 (2)	23.3 (7)	63.3 (19)	6.7 (2)	-	undecided
16. The villagers who grow vegetables by nature farming method should form a group in the village	60.0 (18)	30.0 (9)	10.0 (3)	-	-	strongly agree
17. The nature farming project will be the starting point to change agricultural method in your village	3.3 (1)	23.3 (1)	50.0 (15)	23.3 (7)	-	undecided

Contents	Attitude percentage/(total)					Mode
	Strongly agree	Agree	Un decided	Dis agree	Strongly disagree	
18. After the project is finished,  you are likely to pursue nature  farming method	3.3  (1)	10.0  (3)	86.7  (26)			undecided

\*Negative question.

## 4.2 Research Phase

This phase can be classified into 7 steps as follows;

1. Group vision settlement
2. Task assignment
3. Job description
4. Goal achievement
5. Strategic planning
6. Implementation
7. Assessment

The project work was the collaboration among farmers, leader of community, academics of Vocational training and Development center for Thai people along Thai – Cambodia border area Sakaeo province, related government officials in the area and the researcher. The results of the research were as follow;

### 4.2.1 Group Vision Settlement

The researcher had coordinated with military agencies controlling the village area to hold the meeting. The purpose of the meeting was to brainstorm the project and settle vision, goal and direction for work on nature farming. The

participants comprised 30 farmers from 30 family, leaders of community, Klongkaiuen Tambol Administration clerk, village-governed military officers, academies of Vocational Training and Development Center for Thai people in border area Sakaeo province, Volunteer teacher of the village and the researcher.

During the meeting, the researcher had encouraged the participants, especially villager group, to talk about the problem issues of nature farming method. Moreover, the researcher had presented the data obtained from the questionnaire relating to general vegetable growing data and attitude towards the need for nature farming at the meeting. The purpose was to correct the data and exchange ideas during the talking meeting to settle visions.

From the data, the researcher had classified the presentation into 5 issues : knowledge of growing vegetable, economic data, social data, environmental data and attitude towards nature farming. As regards knowledge of growing vegetable, it was found that the average experience was 2 years in chemical agriculture and more details obtained from the meeting were both leaf-eating vegetable and head-eating vegetable. However, some methods and steps of growing were the same as nature farming method. The others were different. The favorite chemical fertilizer was formula 15-15-15 and urea fertilizer. Another pest control chemical depend on epidemic, the favorite one were Gramoxon, Furadun, Oxa, etc. According to Economic data, no profit was made from selling vegetable products, ie price of all kind of vegetable last year was 1-2 baht per kilograms. This was the main reason for them for not growing vegetable for sale again.

According to social data, although there were 10 social group in village but no nature farming group was set up. During the meeting the farmers gave further data that because of no government agencies or private organization entering there and promote nature farming method seriously and continuously. In addition, no social aggregation was formed for local business administration of nature farming in the village.

As regards economic data, few natural material waste, such as soybean skin, animal droppings and straw were used. The interesting issue was 50% of farmers suffered from farming chemical but 80% of them still used pest control chemical. The president of healthy section in the village added that from last blood check, it was found that of 49 farmers, 20 of them had chemical in their blood pressure which 30 of them were in critical condition that need to be cured immediately.

According to nature farming attitude, it was found that most of them had positive attitude and wanted to have knowledge of growing techniques. However, considering economic attitude, they were not sure about crop price. 90% thought that price of nature farming product in local market was not high and the method of growing could not help.

As regards social attitude, they wanted government agencies to help promote nature farming method and wanted to form a group in the village.

Considering environment attitude, they gave priority to the importance of health problem that they consented to pay more for toxic-free vegetables and want their member in the family to eat nature farming vegetables for health. But they were not certain that this method could help increase their productivity.

Having checked their data in the questionnaires, they gave many additional comments at the meeting and thought that they were not sure in nature farming process since it had never been used before. So they would like to wait for the results before making decision. Moreover, informal data from interviewing farmers and leaders of community relating to agriculture problem had been discussed at the meeting that the researcher had recommended that these issues should be raised to be questions for guidelines on vision settlement of working groups and the participant agreed. The resolution of guidelines for vision settlement was that it should comprised 3 important questions: what was the problem of community ?, the trend towards how could problem be solved and what was the type of desired community?

The group had got together to brainstorm and analyse the problem issues by drawing table in the paper and discuss each issue one by one. The first issue was knowledge of growing technique that most of participants strongly agreed that there should be knowledge promotion in the community. The second issue was economic problem relating to cost and price of crop products including source of invested money. Another issue was social problem that they wanted to form nature farming group but uncertain to whether or not it could happen, next, the health problem from toxic vegetable consumption was discussed. Lastly, the environment was not suitable for agriculture. At last, the visions of group were settled as follow :

*“Farmers in the community will group together to study growing vegetable by nature farming method and obtain nature farming vegetable for consumption in the village and sell it with low cost, make profit. It can be*

*depended on as a career so that they can earn money all year round. Soil and water resources are improved for better quality. The environment in community as a whole, is better "* (Table 16).

**Table 16** Group vision settlement of participants in the PAR project

Issues	Condition of problem	Trends towards solving problem	Type of desired community
1. Knowledge of nature farming	<ul style="list-style-type: none"> <li>- lack of proper knowledge</li> <li>- lack of confidence to do nature farming</li> </ul>	<ul style="list-style-type: none"> <li>- related agencies should go in for help</li> </ul>	interested farmers group together to study growing vegetable by nature farming method including produce vegetable for
2. Economic problem	<ul style="list-style-type: none"> <li>- low price product</li> <li>- loss profit</li> <li>- Lack of labour</li> <li>- high cost</li> <li>- lack of capital</li> <li>- run into debt</li> </ul>	<ul style="list-style-type: none"> <li>- cooperation among members in self-assistance</li> </ul>	consumption in the community and selling with low cost, making profit. It can be relied on as a career so that they can earn
3. Social problem	<ul style="list-style-type: none"> <li>- lack of information</li> <li>- lack of</li> </ul>		money all year round. Soil and

Issues	Condition of problem	Trends towards solving problem	Type of desired community
4. Environmental problem	<p>management</p> <ul style="list-style-type: none"> <li>- lack of social aggregation</li> <li>- lack of technology</li> <li>- weak health</li> <li>- abnormal weather</li> <li>- landscape not suitable for agriculture because of soil; clay, flood, difficult to plough</li> <li>- degraded soil lack of nutrient, plants do not grow well</li> <li>- not enough water resources</li> <li>- toxic mixed in soil, water, air.</li> </ul>		<p>water resources are improved for better quality. The environment, as a whole, is better</p>



#### **4.2.2 Task Assignment**

Having got the group visions, there were task assignment by dividing farmer group into 5 small groups. The relevant participants who got together to brainstorm comprised farmers participating in the project, academics from vocational Training and development center for Thai people along Thai – Cambodia border area Sakaeo province area, village governed military officers, leaders of community and the researcher. Each group comprised farmer, relevant officers and the researcher. At the meeting, the president and secretary of group would be appointed to take note of joint - agreement among the participant and refer it the general meeting. The joint agreement was the task settled by members according to group visions that had fix already. The resolutions of task assignment complied from 5 groups were as follows:

##### **General Task**

Group comprised of member of farmers participating in the PAR project, leaders of community, all related officials would conduct growing vegetable by nature farming method to produce toxic-free vegetable for people in the village with the purpose for members to have good health, reduce cost, make better environment in the village and want to make use of natural material waste.

##### **Task of Each Section**

(1) The farmer had the duty to study the method of growing vegetable by nature farming in both way; theory and practice. The purpose was to be the leader in the field of growing nature farming vegetable so that family and community could have vegetables for consumption to have better health and good environment in community. The period of study was approximately 4 months.

(2) The academics of Vocational Training and Development Center for Thai people along Thai–Cambodia border area .Sakaeo province and the researcher had the duty to teach knowledge, closely support and promote farmer's activities all the time of research project, study local wisdom, listen to the feedback from farmers and cooperate with them in solving their problems and coordinate with related government agencies.

(3) The village governed military officers, related development officials, leaders of community had duty to manage to support these activities, coordinate and participate in the activities as long as the project went on

#### **4.2.3 Job Description**

Having assigned task in 4.2.2 (above), the group settled job description to perform in their work. This was the result of brainstorming the idea to find Strength, Weakness, Opportunities and Threat (S.W.O.T). During operation, the researcher had brainstormed the ideas by way of mixing ideal workshop before the project operated. The group discussed 4 issues as follow; strong point, weak point, opportunities to succeed and threat to hinder them from success.

The researcher had divided the group into small one to discuss 4 issues in the small meeting. Each group had considered each issue carefully, then noted down their comments in the paper. After that, the researcher referred these 4 results to the blackboard for every member to decide simultaneously in the general meeting. Having eliminated the repeated issues and added the imperfect issues, the resolutions are as follows;

### **Strong Point of Community**

As regards the farm land, since they were allocated 10 rai per family from military agencies and another 1 rai for dwelling places, they could cultivate vegetables in both type of land.

As regards the staff, the instructors were skillful and experienced in nature farming method. Whereas the farmers had determination to work hard at full capacity. Another factors were material for agriculture, farmers were ready to perform and the seed for planting were contributed by Klonghad agricultural district office. The cars for material transportation were provided by village governed military officers.

However, they had strong desire to consume, sell toxic-free vegetable, want their family and community to have good health because most of them had toxic residue found in their blood.

Moreover, since they had land for growing in their house precints, they could take care their own crops with every member of family. Watching the development of vegetables, harvest, consume, share and selling them within community was the creation of the warmth in family and harmony in community.

### **Weak Point of Community**

Since the period for operation was rainy season, growing vegetable was quite difficult because of flood and it is risk to be disturbed by pest and plant decease. The instructors-academics of Vocational Training and Development Center could not go to take care closely and give advice on operation as they were far from the sites. Only once a week could they enter into the village. Whereas farmers had enough time to meet them as they had to work in the farm. The price of vegetable crops were low

and it is likely to lead to a profit loss. As community was far away from city center, the communication was inconsistent when crops were transported into town.

### **Opportunities and Possibilities**

There was a good relationship between farmers and staff because everybody would like to succeed in nature farming project and happy to cooperate in solving problems. Although each of them wanted different kind of vegetables, these problems were solved by related agencies which contributed the seeds. Whereas different kind of vegetables and period of harvest did not cause the problem as farmer could exchange their products in the community and there were no over supply since variety of vegetables were harvested chronologically.

As regards the period agricultural academies could not enter into community, volunteer teachers would be the middle man to help solve farmer's problems during project. Moreover, the researcher would work closely to help solve the problems in community. However, some farmers did not have time to grow vegetable as they had to spend that period in the farm, there were appointments for formal meetings on Wednesday evenings apart from informal meeting. Before the meeting, the academies had visited the plot to notice the development.

### **Threat**

The period of growing vegetable in the rainy season, was very difficult to cultivate because of flood and wet soil since the soil in the village was clay. It caused vegetable roots to rot. However, most of farmers had exchanged their ideas and came up with the ideas that they should choose the suitable kind of vegetables for the seasons. These came from past experiences of each farmer. At the meeting, there were variety of view points, criticism, exchange their local wisdom. At last, they

reached the conclusion that each of them would select the kind of vegetables that they were confident as suitable kind for season and productivity. In addition, another resolution was seasonal vegetable that could make a big profit and the purpose of growing by nature farming method was to have it consumed in the family. So, any problem of growing could be solved as it was cultivated by ways of some parts of land that was in the house area. It was quite easy to look more closely and then assign the burden onto members of the family who participate in the project

### **Conclusion**

Having considered the strong points, weak points, opportunities and threats of hindrance in operation, the meeting had come to the common conclusion that groups of farmers would grow vegetable by nature farming method immediately, though it was the rainy season and the academics and all related staff would cooperate to take care and give advice closely by means of meetings once a week.

#### **4.2.4 Goal Achievement**

The researcher had arranged the small group meetings to encourage participants in making comments on their goals. There are 5 small groups. Each group comprised 6 farmers and 1 related staff. The president of groups was to supervise the meetings. The period of time and activities were settled for success according to their goals which complied with Job description.

The conclusions of goal achievement at small group meetings were as follows :

GROUP 1 : The goal was to learn how to do nature farming effectively until they were skillful to grow vegetables within the period of 3 months so that they,

their family and the community could have nature farming vegetables for consumption. All the people were healthy and safe from agricultural toxic.

GROUP 2 : The goal was to conduct research on planting vegetable by nature farming so that they could have vegetables to eat and sell in the future for making a profit to their family. All the people in the community should cooperate and group together for doing business in the community. The members should take about 3-4 months for learning and practicing nature farming.

GROUP 3 : The goal was to experiment on growing vegetables by nature farming method for consumption within 2-3 months. The productivity was to be contributed and shared to participants and non-participants in community. All related staff, leader of the community and farmers should cooperate with each other in working together.

GROUP 4 : The goal was that the farmers could grow nature farming vegetable within 2-3 months and be the leader in this method. In future they will lead the way in growing vegetable so that the use of agricultural toxic will be abolished and members in community will not suffer from toxic.

GROUP 5 : The goal was to bring agricultural material waste such as bagasse, straw, soybean, maize, grass and chick droppings to make decomposing material waste for use effectively in nature farming within 3 months with the purpose to improve soil structure and reduce cost.

Common goal of group on implementation The Ultimate goal was that all farmers in the project had knowledge and skill of growing vegetables by nature farming method within 3 months. They were the center of knowledge development. They could produce nature farming vegetables with low cost. There were social

aggregation into group to develop community and environment together with cooperation of the leader of community, related local officials and the researcher.

#### **4.2.5 Strategic Planning**

The group had discussed strategic planning : the important one was the cooperation among all staff-thinking, implementation, solving problems until activity was succeeded. As regards the implementation, farmers promised that they would experiment to discover whether project was true according to academic's advice . They should not be discouraged by failure that might happen during the process. The officials participating in the project and the researcher would coordinate to create activity, to be determined to teach knowledge and solve problems that might arise. This would comply with local wisdom so as to be accepted and could be used continuously in the community for a long time.

#### **4.2.6 Implementation**

Having settled goal and strategic planning, working groups comprising farmers, local officials especially military men, academics of Vocational Training and Development Center and the researcher began to arrange the table of implementation for work activity going according to period of time. The plan was arranged by all related staff. ( Table 17)

Having planned for implementation, all staff would begin to work accordingly as follows;

##### **4.2.6.1 Observation Tour**

The group had agreed to observe the vegetable marketing for studying basic data relating to market, sale, price and possibility of growing and

**Table 17** Implementation Plan for Growing Vegetables by Nature Farming Method

Activity	YEAR 1999					Performer
	AUG	SEP	OCT	NOV	DEC	
1. Observation tour	x					All staff
2. Teaching knowledge of nature farming	x	x	x	x		Academies
3. Preparation for vegetable plot	x	x				farmers
4. selection of vegetable breeder seeds	x					farmers
5. Cultivation of young plant		x				farmers
6. Plant transferring		x				farmers
7. Nourishing grown vegetables		x	x	x	x	farmers
8. Harvesting				x	x	farmers
9. Making portfolio	x	x	x	x		farmers/ researcher

selling plan. The researcher would coordinate in place of observing. Whereas the military men contributed petrol for vehicles. At last, all parties made up their mind to observe Suranakorn central market, Nakornrachasrima province.

On 25 August 1999, 54 farmers had observed the Suranakorn central market. When they had arrived, the office of central market held briefing which consisted of video tapes, answer to questions, exchange of ideas, and showing the real

situation by tour guides. The farmers had opportunities to interview, talk with vendors in the market about interesting data they offered. It was found that the market was set up in 1989. There were 50 rai of land, 46 shops, market and stalls. The purpose of market establishment was to give opportunities to farmers for selling crop products by themselves, cut middleman out of the system, develop community and increase income for better quality of life. Each day the number of cars carrying goods into market was approximately 400-500 cars. The market went on whole day and night. The entrance fee for small lorries was 90 baht and 120 baht for trucks.

This market was the big wholesale market in the northeastern part. There were a variety of crop products from all parts of country such as *yard long bean, wing bean, egg-plant, chili, large chilli, kale, chinese cabbage, cabbage, chinese mustard, parkia, coconut, tomato, celery, welsh onion, parsley, water convolvulus* etc. The type of package was the size of 10 kilograms plastic bag. The price of vegetable crop was quite cheap. However, there was no toxic-free vegetable selling in the market.

The working group met together after they had come back from observation tour to discuss what they had seen once again via farmer's representatives. Here was remarkable comments made by them;

*"...Very impressed and enjoyed the observation tour. The most important thing is to know the area where the vegetables come from, which ones are high price or low price in the market. The ones seen to be beautiful make us suspicious that they are grown by chemicals. If I have a choice to eat these vegetables, I will think about whether or not because of toyio poisoning causing death. Which one is better. If I am scared of death, I*

*would eat nature farming vegetable but If I don't scare I would eat the chemical vegetable sold here... "*

*".....I've got benefit from this observation tour. I've asked for the price of vegetable and found that the price is not different from our community. If we transport ours to Suranakorn market, we would add transport cost and It will make ours more expensive than theirs. I think we should find the market that is located closer to our community."*

*"The owner of the market is the real one who gets benefit. The sellers hardly get benefit because I've seen many notices saying "Transfer of right in stalls hired". It means that some vendors can sell well but others can't. This observation tour makes us know that which one is high price or low price. Selling vegetables is the most worrying business because when you transport it to somewhere for sale, you must sell it or it will go rotten. All in all I prefer to sell wing bean because its wholesale price is 20 baht per kilogram. Whereas the price of papaya is quite low and should be giving great thought to its viability of profit. "*

However, from this study tour, it had the effect on decision on selection of breeder seeds as some farmers preferred to grow high price vegetable but others liked low price one-no risk for failure. The researcher and academics had give them opportunities to take into account all kind of data before deciding which sort of vegetables to grow emphasis on the one they were confident that there was no failure. In addition, some farmers desired that if the project succeeded, they would find the market to sell their products.

#### **4.2.6.2 Teaching Knowledge of Nature Farming.**

Working group had talked about experiences of growing vegetable to create understanding and improve fundamental knowledge and experience or local wisdom relating to growing vegetable in accordance with new knowledge. The old knowledges they had obtained already were preparation for vegetable plot, selection of breeder seeds, cultivation of young plants, plant transferring, maintenance and harvest of crop products. Some were the same as nature farming method. Others were different. However, of all experiences farmers had got, it was the use of chemicals and chemical fertilizers.

To plan for method of learning nature farming, the group had agreed to have formal meetings once a week at village governed military office. However, informal learning would be monitored by which volunteer teachers in villages and the researcher would coordinator between academics and farmers. Moreover, academics of the center had given the instruction book to farmers for learning by themselves about giving fertilizer, use of herb as the pestcontrol. But many farmers preferred to have academics entering into their village more often than this because if there was a problem, it would be solved immediately. This problem was solved by communication on telephone in case of emergency.

#### **4.2.6.3 Preparation for Vegetable Plot**

In choosing vegetable plots, They were located in the house precincts because it was easy to take care. The size of plot was 1.5 x 8 meters. Each family had 2 plots according to recommendation from academies that it was standard size and easy to look after and harvest including sowing seeds, loosening the soil, giving fertilizer and pulling grass out without stamping on the plot.

Before preparation for plot, the academics and researcher had surveyed the plots belonged to each farmer, it was founded that each of them had different kind of soil eventhough they lived in the same area. Some plots had ground-bottom soil, yellow colour, clay. When the soil was dried, it would be hard and difficult to loosen. In addition, its lack of the fertility. Other house precincts were basin-shape so there were flood problem when it rained. Some area had many fruit-trees and perennial plants which prevent direct sunlight from shining on to vegetable plants. Therefore, vegetables did not grow as well as it should. One of their plots used to have bamboo forest which had a lot of bamboo roots and it was difficult to loosen soil. Moreover, some farmers had to reduce the standard size of plots into suitable sizes because some parts of their plots were used as the places for raising ducks, chicken and mushroom-planting houses.

The agricultural academics recommended farmers loosen the soil and leave it for 7 days and then spread on decomposing material waste and chicken droppings and mix together by chopping into small pieces. However, the soil should not be a hard mass. If there was no rain, it should be watered and left for 7 days to let decomposing waste and droppings permeate into soil thoroughly. The proportion of these natural materials was 50 kilograms of decomposing waste per 3-4 square meters area and 10 kilograms of chicken droppings per 5 square meters area. No tractor was used in ploughing. It was better to lift the plot to prevent flood during rainy season as plant needed oxygen. Flood could cause suffocation of root. Furthermore, farmers should maintain shape of plot as it used to help reduce the cost of growing vegetable because in the second and thrid round of growing year, there was no need to add decomposing material waste except chicken droppings The longer time they used natural waste, the

better structure of soil it would be. However, before sowing seeds, agricultural academics would check the plot to make sure that it was ready.

As regards decomposing material waste, it was made from cooked molasses. The academics had taught this knowledge of making it. To make this kind of fertilizer, molasses was piled on the ground, then turn it over every week. It took 3-4 months for molasses to be cooked and ready to be used. The cost of molasses was 15 tons (15,000 kilograms) per 450 baht which could produce 5,000 kilograms of cooked decomposing material waste whereas chicken droppings belonged to farmers themselves.

The academics, village-governed military officers and researcher had inspected the vegetable plot again and found that some farmers did not prepare the vegetable plot properly. As a result, the meeting was held and there was a demonstration which everybody could understand perfectly.

#### **4.2.6.4 Selection of Breeder Seeds**

All 30 farmers' family demanded a different kind of breeder seeds for growing vegetables. Most of them concentrated on growing the sort of vegetables they had past experiences and they wanted to eat. But some preferred to try to grow one they had never cultivated before. The 15 sort of vegetables chosen were *water convolvulus*, *parsley*, *kale*, *multiplying-onion*, *mustard green*, *Chinese cabbage*, *bitter gourd*, *cabbage*, *wing bean*, *yard long bean*, *angle loofa* and *cucumber*. The seeds were contributed by Klonghad district agricultural office and the distribution of seeds was cooperated by farmers.

Before cultivation, farmers had exchanged their past experiences among each others which the academics and researcher attended to listen to them too. It was

known that farmers had some kind of local wisdom and there was something they did not understand clearly which the academics helped to teach the proper knowledge, especially the selection of buying breeder seeds - the key factors that affected the growth of young plant.

#### 4.2.6.5 Cultivation of Young Plant

Before cultivation, teaching proper knowledge to farmers was held by academics staff. There were 2 methods to cultivate young plant; separation of young plant cultivation before transfer of growing and sowing seeds in the plot. The farmer method was more economical and could choose the strong young plant to transfer of growing. As regards the quantity of seeds used, it depended on the size of seed such as *water convolvulus* was big seed. One kilogram of this seed required 40-50 square meters of growing area.

In operation, most of the farmers had used method of sowing seeds but only few of them complied with the instruction. As a result, when young plants grew densely, in many plots, they were found that they did not grow well. This problem was resolved by pulling some of them out and leaving the gap among them approximately 20 cm.

There were 2-3 main problems in cultivation of young plant; unsprout of parsley, vegetable leaves destroyed by insects name "*Phyllotetra chontanica*" or the farmer called "Jumping flea" which had laid eggs in the ground and baby-flea ate root, problem of flood in the plot due to heavy rain and pets such as chicken pecked at the seeds sowed including dogs stamping on the plots. These problems were raised, exchanged and discussed at the meeting.

Having exchanged the ideas, it was learned that Mr. Thong sarthpanya, the farmer, did not crush parsley seeds and wrap with cloth before sowing whereas other farmers and military officials had used this method and it grew well. This was local wisdom in growing vegetable which complied with knowledge taught by academics. The knowledge was parsley seeds should be soaked in water for 1 day then wrapped with cloth to control moisture and watered it to prevent dryness. When roots had began to sprout, seeds were sowed in the plots. It normally took 3 days for *parsley* to sprout well and no disease or insect disturbance. Some farmers said that other method called "straw cover" could make parsley sprouted well. This was quite right because water did not evaporate, so the soil was moist and parsley could sprout as well as the farmer's method. In addition, if farmers would like to collect breeder seeds for cultivation, they had to wait until the plant grew old. The price of *parsley* grown by nature farming method was quite high now - approximately 170-220 baht per kilogram. As a result, it should be grown for consumption within family and plan for sale in the future.

As regards *phyllostera chontanica* eating young leaves, Mr. Kumpa Boon, one of farmers growing vegetables, had used insecticide called "*Disanto*" spraying on young vegetable plants. The agricultural academics inspected the plots and found that farmers had loosen soil, decomposing material waste and chicken droppings together but the mixture did not blend into the same material. Consequently, some organic waste separated into the hard mass causing over- nutrients in that area, young plants grew pretty well . vegetables were big and too fragrant which insects could smell and attacked the plants. *Phyllostera chontanica* spread widely especially during cultivation of young plant period.

To solve this problem, farmers used soap water and *azadirachta indica* *Var.Siamnensis* spraying on plants. The method was to soak one bar of soap in warm water then grate the soap to mix in one bucket of water. Whereas the proportion of *azadirachta indica* *Var.Siamnensis* to water was 10 spoons of *azadirachta indica* *Var.Siamnensis* to 20 litres of water for spraying to prevent worm and insect. The more concentrated mixture could kill worm completely. Another way was to boil 100 gram of dried-chilli with 1 litre of water until it was tender then mashed it and mixed with 20 litres of water for spraying. In addition, magosa could alleviate worm problem by way of 1 kilogram of its leaves soaking in 1 bucket of water and left for 3 days then it was ready for spraying. However, herbs could solve only partial problems because after *phyllostera chontanica* had eaten young leaves, they laid the eggs into soil then baby-fleas ate roots of vegetables being about to grow. The best way to solve *phyllostera chontanica* epidemic problem was to transfer young vegetable plants to cultivate in another plots which flea could not follow the young plants and herbs should be used for protection while vegetables began to grow.

#### **4.2.6.6 Transplantation**

Seedling with 3-4 leaves can be transplanted when it is strong enough (around 3-4 weeks). Plant cutting is applied for *multiplying-onion*, while seed sowing is for *water convolvulus* and *parsley*. The plantation of cucumber applies the technique of seed dropping. Agricultural academics teach how to transplant seeding without destroying its root by using thumb to uproot seeding. Most farmers know how to manipulate by themselves.

#### 4.2.6.7 Nourishing grown vegetables

Due to the diversity of selected vegetables by farmers, working group will contribute knowledge and solutions found in the real situation to each farmer. Popular vegetables which farmers would like to cultivate were described respectively as follows: *Parsley*, *Kale*, *Multiplying-onion*, *Water convolvulus*, *Mustard green* and *Chinese cabbage*.

**Parsley** was the most popular vegetable among farmers. The problem found in parsley plantation was that its root sprouts late in the early phase. It grew after 6-7 days of seed sowing. Two farmers who failed to plant parsley were Mr. Thong Sarthpanya and Mr. Vicharn Menun, while Mr. Mano Neisoongnern received the best results. There were no pests to disturb the growth of parsley. Average 70 % of productivity from parsley was ranked in good level. Vegetables could be harvest after 3 months of cultivation. Many farmers did not pull *parsley* out and let it grow until it seeds were old enough for the further breeding.

**Kale** was the second popular vegetable. The problems found in nourishing phase was *phyllostera chontanica*. It ate young leaves. Although seedlings were removed to another bed, those seedlings did not grow well. Mr. Kumpa Boon is a farmer facing this problem. There was one farmer decide to use pesticide, he referred that

*"Although pesticide was used, phyllostera chontanica still existed to bore and eat young leaves"*.

Mr. Sombat Chokchai was a farmer who confronted the similar problem. He said that the plantation of *kale* has a lot of problems particularly in rainy season.

Mrs. Somjai Chairangka and other 3-4 farmers said that

*“Leaf roller attacked shoots of kale. We could not pick it out all. Although we did not go to cropping area and spent much time to look after plant bed, the problems by pests could not be solved anymore”*

*“Phyllotetra chontanica made vegetables did not grow well. It always attacks vegetables at nighttime so we can see torn leaves in the morning. In addition, due to flooding, water stagnant on the crop bed for several days damages grown vegetables.”*

Farmers spent 45 days to grow this vegetable but they did not receive a good result due to shrunken feature. Although agricultural academics gave advice, problem from *phyllotetra chontanica*, which attacks kale's leaves, have still existed. However, from observation, most farmers did not follow all steps. In the focus group, it was found that farmers could not remove seedling to other beds in time, when *phyllotetra chontanica* attacked vegetable bed because of water stagnant. Agricultural academic told that during rainy season, it is difficult to grow kale. Although kale grows well in winter season, they receive low price because of high competition and oversupply during that time.

**Multiplying-onion** was ranked at the third popular vegetable which farmers selected to grow. The growth of multiplying-onion was good with fewer

problems. no pest and plant diseases were found in every vegetable bed. However, in the late of October 1999 or in the fifth week of growing, flooding occurred leading to 3 days of water stagnant on the cropping bed. The color of multiplying-onion leaves turned to be yellow color. Some farmers harvested early because they were scared that flood damages the productivity. Farmer said that:

“*Multiplying-onion* grew well. There was rain so watering was unnecessary. No pest but only did chicken and dog disturb vegetables”

“*Multiplying-onion* grew well with easy nourishing. Although, it was attached with *mustard green*, *phyllosticta chontanica* attacked only Mustard green. During this period, watering was unnecessary because of everyday raining.”

Other farmers gave a similar refer about easy growing of *multiplying-onion*. Some *multiplying-onions* were kept for the further breeding and some vegetables were pickled such as pickle *multiplying-onion*. Farmers got enough surpluses to distribute to their neighbors. It was concluded that the average 75 % of productivity from *multiplying-onion* was ranked in good level.

**Water convolvulus:** Seed of morning glory was bamboo leaf specie. This specie owns the shortest period of plantation among all selected vegetables. Farmers can harvest the product after 21 days of plantation. Seed sowing was very popular technique but there were 2-3 farmers followed the advice of agricultural academic to mix seed with compost manure and topsoil before sowing. Such technique reduced the

required seed. Harvesting of morning glory could be carried out faster than of other species. Damages could not be found. In addition, farmers could sell the products in 10 baht/kg to public servants

From observation, sunlight was an important factor, which lead to uneven growth. If cropping bed is located under tree's shadow, morning glory will not grow well. In addition, if there are many weeds on the bed, morning glory will not grow well as expected due to high competition for nutrients. Farmers perceived this finding from their direct experiences. . It was concluded that the average 90 % of productivity from morning glory was ranked a good level.

**Mustard green:** Only did four farmers select to cultivate *mustard green*. Harvesting can be performed after seedling is transplanted for 45 days. Under the nature farming, plantation of *mustard green* particularly the cultivation with technique of mixing seed with compost manure and topsoil provided good productivity following *water convolvulus*. During seedling phase, *phyllostera chontanica* has attacked the *mustard green* but damage was less. Farmers shared their seedling to others whose cropping beds were attacked by pest. However, in the last phase of plantation, there was water stagnant on the cropping bed leading to rotten root and brown leaves so farmers harvested the products early. Some vegetables were pickled and the rest was distributed to neighbors for fresh consumption. . It was concluded that the average 70 % of productivity from *mustard green* was ranked a good level.

**Chinese cabbage:** The reason that farmers were interested to grow *chinese cabbage* was short period of plantation, Vegetables can be harvested after 45 days of transplantation. *Chinese cabbage* applied similar techniques in nourishment as *mustard green*'s. Pest was the problem found during the seedling phase. If compost

mixing and soil crushing is not carefully performed, pest could smell and came to disturb.

There was social phenomenon during the plantation, which obstructed one family, joining in PAR project, continue their cultivation. Their son died due to accident so they spent much time to arrange funeral ceremony and some participated farmers helped this family to organize ceremony. This phenomenon affected several farmers in the nourishing phase , however, it provided short-term impact because during that time it rained everyday and this event entailed unity and ethic into the community.

The bed, which was raised up offered good productivity particularly in the late of harvesting phase because it was not flooded. For example, the bed prepared by Mr. Thong Sartpanya provided a good productivity so that he could distribute products to his neighbors. Other 3-4 farmers could harvest enough *chinese cabbage* for household consumption. It was concluded that the average 75% of productivity chinese cabbage was ranked in good level.

**Chinese mustard** : Only did one farmer cultivate *Chinese mustard* . He succeed to look after his crop although he found problems during the plantation such as heavy flood, *phyllostera chontanica*, which attacked vegetable leaf, and leaf roller, as well as snails which attack leaf at nighttime. Some farmers faced the problem in vegetable bed located under tree. Less sunlight made vegetable do not grow well.

Farmers who applied nature farming techniques to control pest such as soap water, snail capture by hand said that these techniques could not completely solve the problem. *Chinese mustard* derived from nature farming did not have perfect feature. Its leaves bloomed. However, in general, farmers could harvest enough productivity

for household consumption and for distributing to neighbors. . It was concluded that the productivity from mustard green was ranked in middle level.

Beside the above vegetables, other vegetables such as *cabbage*, *bitter gourd*, *winged bean*, *yard long bean*, *angled loofa*, *cucumber*, *parsley*, *asparagus* and *caparid* also were selected to cultivate. However, in fact, farmers who intended to cultivated *yard long bean*, *angled loofa* and *cucumber* could not participate the project because one farmer was in pregnancy. Others formed new family and her husband had to work outside so there was no labor force to manipulate nature farming.

**Asparagus and cabbage** was not cultivated because one farmer who would like to cultivate these vegetables was engaged by urgent military mission, while another one could not follows activities due to no time to look after cropping bed.

**Carapid:** Due to being local vegetable, farmers could cultivate *carapid* everywhere. No pest and plant diseases disturbed vegetable. Harvesting could be performed after 3-4 weeks of plantation. The product was pickled for household consumption and the rest was distributed to neighbors. Farmers can harvest *caparid* for several times because after cutting, it will sprout again. Therefore, many farmers were interested to plant *caparid* and they would like to get seed from neighboring farmers. . It was concluded that average 90% of productivity from caparid was ranked in excellent level.

#### **4.2.6.8 Harvesting**

Each vegetable has different harvesting period. Most farmers knew when each vegetable should be harvested. However, agricultural academics from Vocational Training and Development Center have still contributed knowledge of plant harvesting to farmers.

In fact, there are many natural phenomenon such as heavy rain and flooding obstruct harvesting in the appropriate period because such phenomenon bring about rotten bore and shortage of air for root. The color of *mustard green* and *morning glory* will turn to be yellow and brown colors, meanwhile, the size of *multiplied-onion* and *kale* is shrunken leading to early harvesting for household consumption not for selling. However, there were 2-3 farmers whose vegetable beds did not receive the impact from flooding so that they could harvest following the cropping calendar. Vegetables in nature farming grew well with heavy weight and fresh green. Farmers especially Mr. Thong Sarthpanya who succeeded to plant *chinese cabbage* and *morning glory* said that they planted vegetable for household consumption so they did not worry about chemical toxic. Mr. Mano Neisoonern could distribute *mustard green* to his neighbors because he received a good productivity from his experimental bed and he did not intend to sell such products. The rest of vegetable was pickled. In addition, he also cultivated *multiplied-onion* and *parsley* and distributed both fresh and pickled vegetables to his neighbors.

In conclusion, most farmers could cultivate vegetables in a good level but some vegetables could not be harvested following cropping calendar due to plant diseases and flood. However, early harvested vegetables were kept for consumption. Some farmers started cultivation early in order to harvest vegetables in time and to avoid heavy rain and flooding. In addition, most farmers gradually collected vegetable as demanded for consumption because it was grown in home garden. Farmers have experienced that if vegetables are cultivated for consumption, diversity of plant species should be concerned and farmers should not cultivate in high volume. In addition, if different species are cultivated in neighboring area, the products can be

exchanged within community. Farmers realized that the products from nature farming would get a good price when harvesting schedule, concerning to price and demand in the market, is carefully set. Moreover, the solution to plant diseases in nature farming should be seriously and consistently studied.

#### **4.2.6.9 Making Portfolio**

In practices, portfolio was organized in order to follow the progress in learning development and practices of nature farming among farmers as well as the project assessment. The group agreed to assign this task to researcher. Due to limitation of time, farmers were grouped so that researcher could assign data recording to the group and then researcher had responsibility to gather all farmers' portfolio. Farmers were divided into 5 groups with regard to the proximity of neighborhoods and convenience of working condition. Assignments were consisted of memorandum on knowledge and understanding in steps and methods of nature farming, records on expenses invested in nature farming, problems, obstacles and solution executed by group's members during the performance.

Another assignment collected by researcher was consisted of photographs concerning to the evolution of cropping in nature farming since the early phase of implementation, table record on the implementation plan and its results, participatory and non participatory observation form. Such assignments were in general applied to assess the achievement of the project. After finishing the performance, working group mutually considered and exhibited the excellent assignments (table 18).

**Table 18** Objectives and types of assignments gathered in portfolio.

<b>Portfolio</b>	<b>Objectives</b>	<b>Types of Assignments</b>	<b>Evaluator</b>
1.Farmers' portfolio	To observe the progress in learning development and skills on nature farming. This assignment was performed in-group.	-Records on the steps of nature farming and details of the performance. -Records on expenses and income deriving from nature farming -Records on problems, obstacles and solutions occurring during the performance	1.Agricultural academics from the center. 2.Village administrative leader. 3.Communal leader. 4.Researcher.
2.Projects' portfolio	To investigate trends and direction of project as well as farmers' participation on the practices of nature farming.	-Photographs relating to the evolution of vegetable crops. -Schedule chart relating to the implementation plan and its results. -Participant and non-participant observation form recorded during the performance of nature farming.	All working groups

### **(1) Farmers' Portfolio**

Assignments were gathered and organized in-group. Works of each group were consisted of memorandum on the steps of nature farming, records on expenses and income deriving from nature farming and records on problems, obstacles and solutions occurring during the performance. The details of such works were described as follows:

#### **1) Memorandum on the Steps of Nature Farming**

Memorandum was divided into 5 groups. From 30 farmers participated in the project, 27 farmers could execute all activities set in the program. The remaining 3 farmers could not join in because one farmer was engaged by his mission as communal leader leading to no time to participate, the other one was engaged by urgent assignment from military. The last farmer had health condition due to her pregnancy so that she could not join this performance.

In the memorandum, each group should record the following details.

#### **Garden bed preparation**

Some groups found the problems in the process of cropping bed preparation. Each group helped each other to prepare cropping bed following advice given by agricultural academics from Vocational Training and Development Center. Most problems found during the process of bed preparation was soil condition, which was not suitable for cultivation due to lack of fertility. Since most soil was dug up from the bottom of pond, its properties were hard and sticky. Too much water content in soil or water saturated soil led to the difficulty to mix soil with fertilizer. In addition, bamboo had ever grown in cultivated area so its roots has existed. Moreover,

tree and orchard have mostly occupied home area so there was little space to receive enough sunlight for home garden.

In overview, The facilities for bed preparation were not the problem because there were enough facilities and group's members helped each other. Meanwhile, the problem in bed preparation was time to spend for bed preparation, which usually set in the period of crop harvesting and job recruitment. Farmers were not confident whether the process of bed preparation is correct and cropping system with the technique of nature farming is successful.

After checking the record on bed preparation, working group visited the finished vegetable bed and gave advice to farmers. The results indicated that although farmers learn how to prepare bed, some farmers could not manage bed preparation completely. they usually miss some steps such as soil loosening, timing in bed drying and mixing of compost manure and chicken manure leading to the adverse impact on the growth of vegetables. Therefore, agricultural academics had to explained and demonstrated again.

### **Seed selection**

Each farmer selected seed more than 2-3 species. The decision on seed selection depended upon individual experience in the past to grow such vegetable successfully. However, after tour investigation at Suranakorn Central Market in Nakhonratchasima Province, some farmers decided to change seed because they would like to try other species contributing to high price. The first three popular seeds which farmer selected to cultivate are described as follows respectively, *chinese cabbage*, *kale* and *multiplying-onion*.

### **Seedling and Transplantation.**

The techniques to plant seedling can be both of seed sowing in the garden bed and prepared seedling bed. Farmers selected to apply the first method rather than the last one. In order to protect seedling from animals, farmers have fenced the seedling bed with blue nylon net and woven bamboo. This technique represented indigenous knowledge and local materials

Seed will sprout after 3 days of seed sowing, while transplantation can be performed after 3-4 weeks but some vegetables do not need transplantation such as *water convolvulus*, *parsley* and *multiplying-onion*.

For pests, there is only *phyllosticta chontanica*. However, farmers can apply extracted *azadirachta indica* Var. *Siamensis* for pest control. For grass, farmers will pull it out. With regards to the group applying the seed sowing, they pulled weak seedlings grown in the condensed area and left strong seedlings exist. Watering is carried out once a day. Since there was rain everyday during the seedling period, there was no problem on water shortage but heavy rain leading to bruised seedling.

The problem on *parsley*'s seed, which did not sprout, was discussed in the focus group, and finally they found that *parsley*'s seed sprouts later than other seeds, it take 5-6 days for sprouting. Therefore, before sowing, seed should be crushed and covered with damp clothes. *Multiplying-onion* and *water convolvulus* grow well without any problems.

### **Nourishing grown vegetables**

According to the record in farmers' portfolio, there were many interesting issues as follows;

The problem in the vegetable sprouting caused by pest such as *phyllostetra chontanica*, leaf roller aphid. The vulnerable plants to pests were *chinese cabbage*, *mustard green*, *kale*, *yard long bean* etc. The solution for pest control, farmers applied natural techniques such as picking by hand and herbal pesticide like extracted *azadirachta indica* Var.*Siamensis*. *Azadirachta indica* Var.*Siamensis*' leaf is a material to produce extracted *azadirachta indica* Var.*Siamensis* by crushing it for water and leaving the extracted water for 3 days and then blending it with water at the ratio of 1:4. However, such extracted *azadirachta indica* Var.*Siamensis* do not provide a good result. Besides pest, there are plant diseases provide adverse impacts to vegetables such as rotten root and fungi. *Multiplying-onion* is vulnerable to plant diseases. The above problems are shown in the following examples found in farmers' portfolio.

*" Phyllostetra chontanica and plutella xylostella is a serious problem. Uneven growth is another problem too. Sunlight may be the cause of such problems. In addition, snails usually attack mustard green in the nighttime so farmers have to pick it out and then kill it, however in daytime, the problem from snails is less. Due to heavy rain and strong sunlight will make mustard green wither. Water convolvulus received the best productivity"*

*" I always monitor my cropping bed whether it is attacked by pest. I told the truth that I worry about my vegetables, however, there is no pest to disturb it. Concerning to watering, it is carried out once a day when there*

*is no rain. During the plantation, it rains everyday so the problem from water is not be found"*

*" I worry about my vegetable because leaf roller always ate its leaves. If I pick it out, I am worried that leaf roller will attack the rest."*

*"Kale is vulnerable to phyllotetra chontanica, but multiplying-onion does not have such problem. Watering from water supply is executed once a day. However, during the plantation period, it rains everyday, watering is unnecessary. When weeds grow up, it must be pulled out by hand"*

*"Although mustard green and cabbage grow well but it is scratched and ate by chicken so I have to request seeds from Mr. Mano and then cropping bed must be fenced by net. Multiplying-onion also grow well"*

*" Parsley grow well but kale has the problem with dwarf feature and yellow leaves"*

According to the record of Mr. Kampa Boon who used pesticide, the details are described as follows;

*" I planted kale by the technique of seedling and transplantation Since there were phyllotetra chontanicas and leaf rollers to disturb kale, I spayed pesticide named Disanto but it did not work so I had to spray pesticide*

*again because vegetables will be damaged if nothing is done. Concerning to the damaged bed attacked by animal, bed was fenced by bamboo materials in order to protect vegetable from chicken and dog. In the last phase of plantation, heavy rain was the problem entailing rotten bore and root so I decided to harvest early”*

### **Harvesting and the Management of Production Deriving from Nature Farming.**

Harvesting by pulling, cutting and plucking should be applied in accordance with plant species. According to the farmers' record, the problem in the step of harvesting was not found because of cultivation for household consumption, which paid attention to safety rather than beautiful features. The high yields derived from *water convolvulus*, *Mustard green*, *multiplied-onion* and *parsley* respectively. In particular, farmers could harvest *water convolvulus* with a good quality in the appropriate period. Therefore, *water convolvulus* provided the best results in this cultivation.

#### **2) Record on Expenses and Income Deriving from Nature Farming.**

This record was consisted with the cost on bed preparation, compost, facilities, seed, labor, transportation etc. Every group took a note and then researcher gathered and summarized as shown in Table 19.

According to the record on income deriving from product selling, it was found that farmers participating the project could sell vegetables, such as *water convolvulus*, *chinese cabbage*, and *mustard green*, in 10-15 baht/kilogram for 2 month-period. The average productivity, which was sold in the market, was 80

kilograms. After all incomes were gathered, it was found that farmers could earn 24,000 baht/ month or 888.88 baht/month/household. Farmers could sell the productivity for 2-month period. However, most farmers did not sell the productivity but it was kept for household consumption. In addition, farmers found that they could reduce the expenses to buy vegetables from the fresh market estimated at 30 baht/household. Moreover, the vegetables could be kept for a long time to serve household consumption. In particular, such vegetables could be used for the further breeding. As consequences, agricultural family could save the cost estimated at 24,300 baht/month for 2 month-period. The whole project could save the expenses 48,600 baht/month or 900 baht/household/month. Some seeds can be kept for the further cultivation so they can reduce the cost in the further cultivation.

## **2) Problems, Obstacles and Solution to Nature Farming.**

Each group found similar problems, problems and its solutions were categorized and presented in Table 20

### **(1) Project's Portfolio**

Researcher gathered this portfolio during the performance in order to investigate trends and direction of this project as well as the participation on the performance in nature farming among farmers. This portfolio was consisted of the photographs in relation to the evolution of vegetable crops, schedule chart on implementation plan on nature farming and its results, as well as participant and non-participant observation form

**Table 19** Expenses and Cost to Perform the Nature Farming in the Project

<b>Items</b>	<b>Numbers</b>	<b>Expenses (baht)</b>	<b>Remarks</b>
1. Seeds (from Provincial - agricultural office in			
Amphore Klonghad			
Water convolvulus: bamboo - specie	1 bag	75	
<i>Hybrid parsley</i>	2 bags	140	
<i>Kale</i>	1 big can	150	
<i>Mustard green</i>	4 small cans	24	
<i>Chinese cabbage</i>	4 small cans	24	
<i>Bitter gourd</i>	1 small cans	9	
<i>Hybrid cabbage</i>	1 big can	100	
<i>Winged bean</i>	3 small cans	18	
<i>Yard long bean</i>	3 small cans	21	
<i>Hybrid angled loofa</i>	2 small cans	80	
<i>Cucumber</i>	1 small cans	50	
<i>Asparagus</i>	1 small can	50	
<i>Chinese mustard</i>	1 big can	70	
<i>Caparid</i>	1 small can	6	
<i>Multiplying-onion</i>	22 kg.	990	
Total seed cost		1,822	

Items	Numbers	Expenses (baht)	Remarks
Fertilizer cost	180 KorSor	8,000	
Compost manure	(9,000 kg.)		
	120 bags	1,200	
Chicken manure	-		
2. Facilities cost	1 person/ household	15 baht/ day/ household. In total 24,300 baht	120 baht/day
3. Labor cost			
4. Transportation cost	-	-	
Total cost		35,322 baht	1,177.4 baht/ household

**Remarks:** Numbers of Crops in Nature Farming was 54 Crops with Size of 1.5 X 8 meters.

### 1) Photographs Relating to the Development of Cropping System in Nature Farming.

Research gathered all photographs relating to the development of cropping system in nature farming performed by participated farmers in order to study learning development in nature farming and their practices. Photographs were related to the study area before the performance, tour investigation, activities to contribute

theories and practices in nature farming, bed preparation, seed distribution, seedling, transplantation, the growth of vegetable in every phase, the problems found in nature farming and harvesting, as well as the focus group and sub group discussion. Photographs relating to all phases of practices were presented and exhibited as farmers' works and then committees selected the excellent works.

**Table 20** Problems, obstacles and solutions to cropping system in nature farming performed during the participatory research action.

<b>Problems and obstacles</b>	<b>Solution</b>
<p><b>The step of bed preparation</b></p> <ol style="list-style-type: none"> <li>1. Soil condition with hard and un-nourished clay.</li> <li>2. No space enough to make a good bed.</li> <li>3. Flooding.</li> </ol>	<p><b>The step of bed preparation</b></p> <ol style="list-style-type: none"> <li>1. Neighbors helped to prepare bed in case of family, which there was no enough labor force to do this task.</li> <li>2. Group gave advice to cultivate on the remaining space by ignoring the shape of bed.</li> <li>3. Consulting with agricultural academics from Vocational Training and Development Center</li> </ol>
<p><b>The step of seed selection</b></p> <ol style="list-style-type: none"> <li>4. Seed was not suitable with season</li> <li>5. Farmers would like to plant other seeds but lacks of experience in the</li> </ol>	<p><b>The step of seed selection.</b></p> <ol style="list-style-type: none"> <li>4. Less cultivation under close nourishment.</li> <li>5. Consulting with agricultural academics from Vocational Training</li> </ol>

<b>Problems and obstacles</b>	<b>Solution</b>
<p>Cultivation of selected seed.</p> <p><b>Seedling, sprouting and transplantation</b></p> <p>6. Parsley seed did not sprout</p> <p>7. Seedlings of <i>kale, chinese cabbage, mustard green, mustard green</i> were attacked by <i>phyllostera chontanica</i> and <i>plutella xylostella</i></p> <p>8. Chicken and dog scratched and crushed upon seedling.</p> <p><b>Nourishing grown vegetables.</b></p> <p>9. Flooding leading to rotten bore and roots as well as plant disease like fungi.</p> <p>10. The leaf of <i>multiply-onion</i> turned to be yellow color.</p> <p>11. Many vegetables did not grow.</p>	<p>And Development, and experienced farmers joining the project.</p> <p><b>Seedling, sprouting and transplantation</b></p> <p>6.Observing other participated farmers and consulting with them</p> <p>7.Consulting with agricultural academics from t protect vegetable Vocational Training and Development Center, and local administrative leader.</p> <p>8.Consulting with group and deciding to fence the crop by using net in order to protect vegetables from animal.</p> <p><b>Nourishing grown vegetables.</b></p> <p>9.Consulting with agricultural academics from Vocational Training and Development Center.</p> <p>10.Harvesting for consuming and pickling</p> <p>11.Early harvest and consulting with agricultural academics to find out the</p>
	<p>solution for the further cultivation.</p>

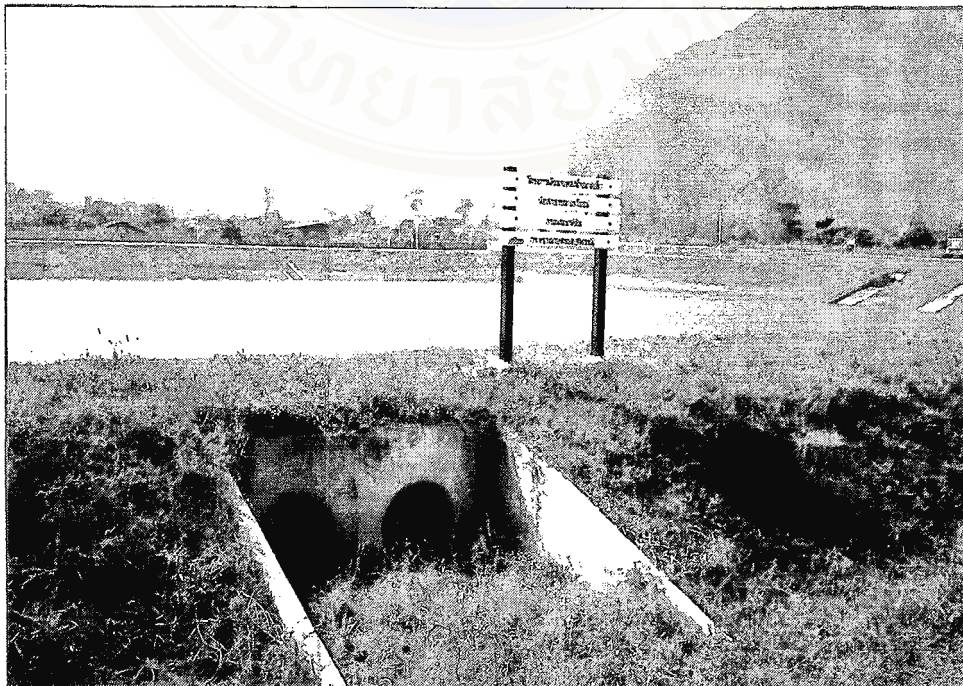
<p><b>Problems and obstacles</b></p>	<p><b>Solution</b></p>
<p><b>Harvesting and management of productivity.</b></p> <p>12. Early harvesting due to rotten root, less weights and dwarf vegetable.</p>	<p><b>Harvesting and management of productivity.</b></p> <p>12. For household consumption and distributing to neighbors as well as for pickling.</p>



**Picture 5** The area condition before the performance showed inappropriate land use. Some areas had weeds.



**Picture 6** Water Sources in the Village are Available for Nature Farming



**Picture 7** Reservoir that Farmers Used for Agricultural on their Farmland.



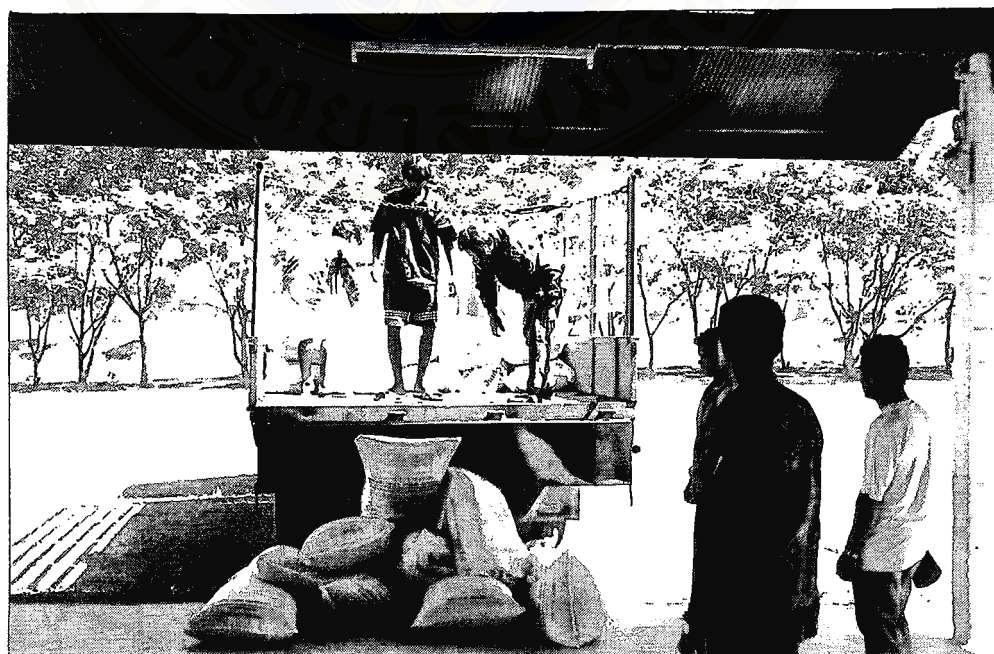
**Picture 8** Tour Investigation at Suranakhon Central Market at Nakhonratchasima Province. Vegetables with Perfect Feature are Available there because most Farmers use Chemical Substances.



**Picture 9** Focus Group with Communal Leader and Relevant Stakeholders was Organized Before the Participatory Action Research.



**Picture 10** Cropping Areas that Owned by Some Participated Farmers Showed the Bad Quality of Soil with Hard Properties Leading to Difficulty of Soil Loosening.



**Picture 11** The Participation of Farmers. Joining in the Project, in Soil Conditioning by Applying Compost Manure and Chicken Excrement in the Cropping bed.



**Picture 12** The Participation on Seed Distribution to Participated Farmers. These Seeds were Complementary by Provincial Agricultural Office.



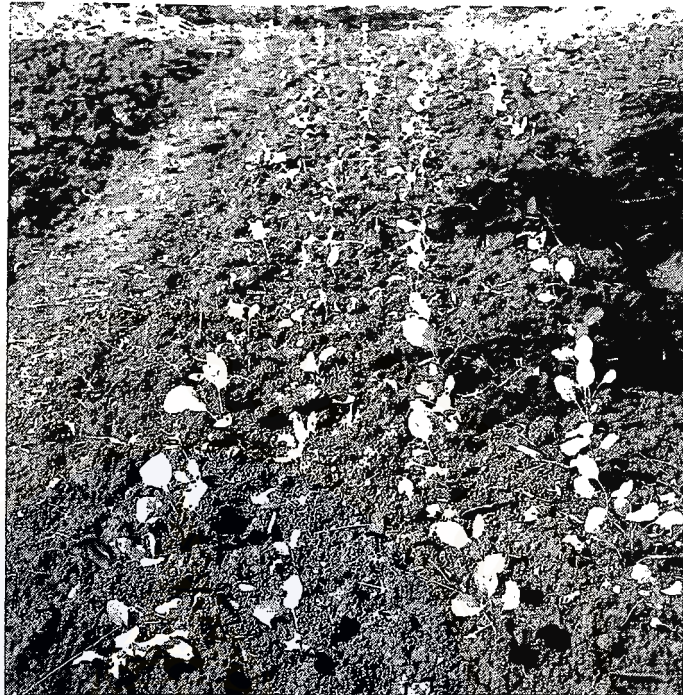
**Picture 13** Academics Contributed Knowledge on Nature Farming. Sub Group Discussion for Brainstorming was Organized During the Participatory Research Leading to the Exchanged Experiences and Mutual Finding for Solutions.



**Picture 14** Bed Preparation by Farmers was the Starter Point of Environmental Development in the Community.



**Picture 15** 1 Week Seedling in One Farmers' Bed Grew well without any Problems



**Picture 16** Transplantation could be Carried Out after 3 Week-Seedling under the Advice of Academics. Transplantation in Rows was Executed in order to Nourish Vegetable Bed Easily.



**Picture 17** Nourishing Grown Vegetable by Picking Pest out from Seedling. It was found that Farmers Closely Paid Attention to Nourish their Vegetable beds.



**Picture18** During the Seedling Preparation. It was Found that Some Farmers Faced the Problems about *phyllostera chontanica*. Which Attacked Vegetable Leaves.



**Picture 19** During the Heavy Rain, Snails Ate Vegetable Leaves and Made Its Leaves Tear.



**Picture 20** Vegetables Bed Located Under the Big Tree cCould not Receive Sunlight Evenly. During the Growth Period, Vegetables in the Shadow Side became Dwarf. Meanwhile the Others Facing to Sunlight could Grow Well.



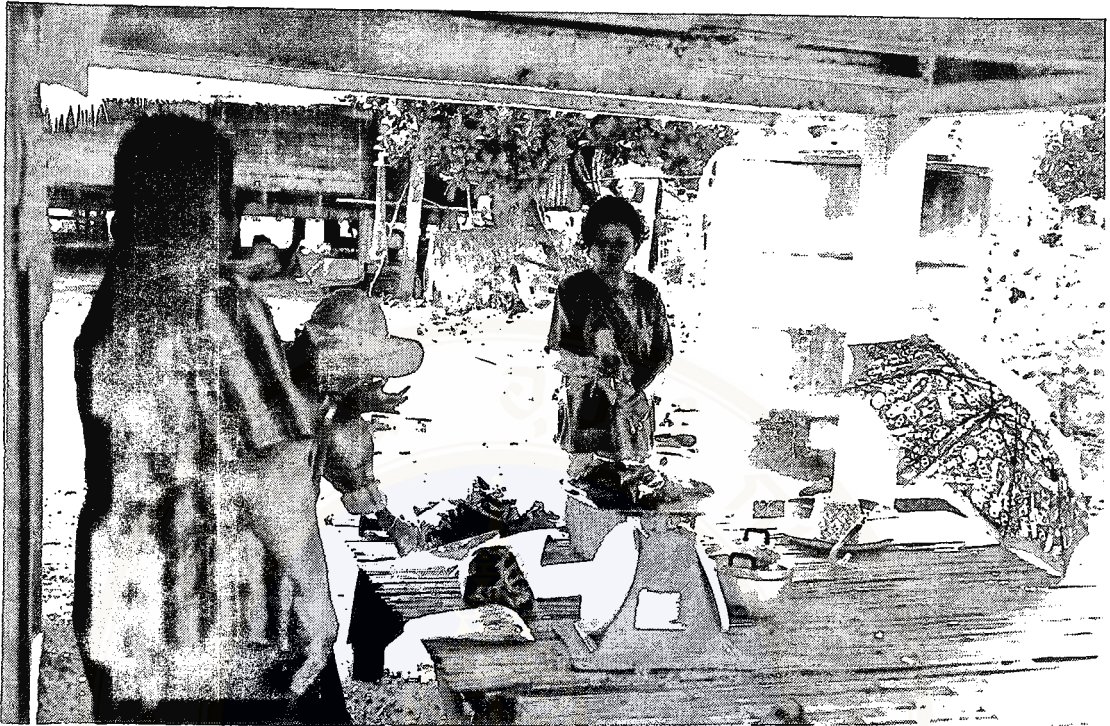
**Picture 21** Some Vegetables Faced the Problems on Fungi and Rotten Root due to Water Stagnant over the Cropping Bed for Many Days.



**Picture 22** Some Farmers Raised their Cropping Beds up in order to Avoid Flooding Problem.



**Picture 23** Harvesting Period Which Enable Farmers Receive Good Quality and Chemical Free Productivity



**Picture 24** The Productivity could be Exchanged and Distributed Among Neighbors in the Community and the Rests could be Sold.



**Picture 25** Chemical Free Vegetables Deriving from Nature Farming were Consumed in the Household because It Ensured the Safety and Healthy of Family and Community.



**Picture 26** Some Vegetables were Kept for the Further Breeding Leading to the Cost Reduction. In Addition, Seed Exchange could be used as a Tool to Build up the Unity and Ethics in the Communal Members.



**Picture 27** Some Vegetable Beds Performed by Farmers Joining in the Participatory Action Research Showed the Diversity in Vegetable Beds Up to 10Species.



**Picture 28** Most Farmers have Continued the Nature Farming After the Project Finished. It meant that Project could Achieve the Aims of PAR and the Vocational Development in Agricultural Area under the Concept of Sustainable Environmental Development by Communal Members.

**1) Schedule chart showing the implementation plan and its results on nature farming.**

Farmers, relevant stakeholders and researcher mutually set up schedule chart on the implementation plan by considering the appropriation and possibilities of each activity as well as available time. This chart was created in order to assess whether all tasks were successfully operated in time as expected as well as the problems found in each phase.

According to the comparative results, 2 activities, which were tour investigation and seed selection, could manipulate in time. In other hand, 7 activities which consisted of educating theory and practices on nature farming, bed preparation, seedling, transplantation, nourishing and harvesting, could not perform in time as expected.

**Table 21** Results of practices in nature farming by farmers joining PAR

Activities	1999					2000	
	Aug	Sep	Oct	Nov	De	Jan	Feb
1. Observation tour	X						
2. Teaching knowledge of nature farming	X	X	X	X	X		
3. Preparation for vegetable plot	X	X	X				
4. Selection of vegetable breeder seeds	X						
5. Cultivation of young plant		X	X	X			
6. Plant transferring		X		X			
7. Nourishing grown vegetables		X	X	X	X	X	
8. Harvesting				X	X	X	
9. Making portfolio	X	X	X	X	X	X	X

## **2) Participatory and no participatory form**

Researcher observed and took a note about the activities on farmers' participation in nature farming. It was found that in the farmers' participation in the communal level, local military unit played an important role to mobilize and unite people in Tubtim Siam 05 Village. Besides activity coordinator for local people, they have worked as guard and facilitator for staffs and farmers. According to relevant staffs, sincerity and mindfulness particularly consistent activities were significant factors to make local people trust and confide in them. When farmers confront problems, staffs should not ignore the problems but they have to mutually find out solution with farmers because it will encourage farmers to keep an activity that make the project succeed as expected. In addition, communal leaders also have played an important role to formulate the cooperation and they have acted as activist. If communal leaders recognize the activity's benefit and participate program, it is easy to get the cooperation from local people, and activity is promoted rapidly, because the community coexists in the relation of kindred and communal members respect their leader.

Farmer's willingness to perform activity was a significance factor influencing the enthusiasm, consistent performance, group unity, mutual solution finding and close cooperation as well as non profit performance. These characteristics make activity get thorough successfully. However, it was found that in a real world, there are personal issues that obstruct the activity or make performance discontinue. Some farmers have social and personal problems such as poor health due to pregnancy, missions of local representative or leader etc.

#### 4.2.7 Assessment

Assessment conducted in research phase was described as follows;

4.2.7.1 The assessment from portfolio was authentic assessment. The evaluators consisted of the representatives from 3 sectors: 2 evaluators were selected from participated farmers, local administrative leader was selected as a representative of military sector, academic and researcher were selected as representatives of Vocational Training and Development Center. It was found that all participated farmers understood nature farming and they had the development leading to the positive practices. After project finished, all participated farmers could harvest vegetables for their household consumption. With regards to the selection of the excellent assignment operated by farmers, the evaluator group selected the works organized by Mr. Mano Neisoongnern as the best one. His work was a good model for other communal members to observe the performance of nature farming

4.2.7.2 Assessment in the socio-economic and environmental aspect.

Researcher applied portfolio and observation data concerning to socio-economic and environmental aspects for authentic assessment. The analysis based on the record in expenses and income deriving from vegetable cropping and farmers' portfolio with regards to the step of practices, as well as the participatory and non-participatory observation form. It was found that the socio-economic and environmental aspects were changed as follows;

(1) Economic aspect: Income deriving from the products of nature farming was higher than expenses. In the first month, total productivity of this project could earn 24,000 baht or 888.88 baht/household. The harvesting period lasted within 2

months so it enabled project to earn 48,000 baht in total. Meanwhile, projects invested only 35,322 baht.

In addition, the expenses to buy vegetables for consumption were also reduced about 30 bath/household or 900 baht/household/month on average. In overview, this project could save 48,600 baht within 2 months. Moreover, some vegetables could be preserved such as pickled Mustard green, and caparid.

According to less fertilizer required, farmers can reduce production cost in the next cropping, It is unnecessary to add more compost manure for the next cropping, only little chicken excrement, which is available in the community and farm, is required.

(2) Social aspects: It was found that the relation in farmer group, established to help each other in social and agricultural activities, was stronger. There was a space for exchanging and listening to other ideas. Group meetings for solving the problems was organized under the way of democracy society. Productivity exchanges between community was available. Product distribution to neighbor and relatives presented the generosity. The group formation to produce compost manure was initiated and then the division of labor to run vegetable business at the communal level was referred. Some interesting people volunteered to look after the market of nature farming.

Concerning to the relationship between offices dealing with agricultural activities and farmers, It was found that most farmers consistently contacted agricultural academic from Vocational Training and Development Center for agricultural training. They also dealt with military when they would like to extend the cropping area. Village committees consulted with researcher, agricultural academic

and village administrative military about the possibility to contact with business sector, which sell the products from nature farming.

(3) Environmental aspects: According to interview, every farmer referred that soil properties were better and more loosening. They would no longer use chemical substances because they believed that compost manure is better than chemical manure, which make soil hard. In addition, farmers talked about the remnant materials to make compost manure. For example, after corn is grown until its height is at 1 foot, it will be turned into soil as green manure leading to cost reduction so that farmers can extend their cultivated land for nature farming. Moreover, extracted *azadirachta indica Var.Siamensis* can be applied in the cropping process.

Concerning to the extension of cultivated area for nature farming, Some farmers would like to extend cultivated area for household consumption because they confided that the products are less harmful than the one sold in market. The mentality among farmers was better because they were happy to consume vegetables, which they grew on their own with the techniques of nature farming. Farmers using chemical substances for perfect feature of vegetable refused to consume their own vegetable, but vegetable from nature farming, although its feature is not good.

In summary, farmers joining in the project had the development in positive direction particularly in socio-economic and environmental aspects. The income from vegetable selling was higher than expenses. Daily expenses were reduced because the vegetables were grown for household consumption. In social aspect, farmers were united to help each other and there was a tendency that farmers will establish a nature farming group. In environmental aspect, remnant material such as animal excrement and weeds are used as mulches to cover soil surface. In health issue, chemical

substances used for agriculture were reduced. The farmers did not have risk to get poisonous substances remaining in the vegetables or obtain the poisonous substances during spraying chemical substances.

### 4.3 Post Research Phase

Researcher conducted the following procedures in post research phase

4.3.1 Achievement in learning nature farming: Questionnaire was constructed to measure the achievement in learning. The contents in this questionnaire consisted of the understanding in nature farmig, compost manure and its advantages. There were 15 questions in total. According to the comparative results of pre-test and post-test, It indicated that farmers joining in the project know more.

**Table 22:** Comparative achievement between pre PAR and post PAR in learning nature farming.

<b>Achievement in learning nature farming</b>	<b>Number</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>t-test</b>
Pretest	27	6.67	1.2089	31.67**
Protest	27	12.74	3.4927	
N = number of sampling		DF= 26	Significance 0.01	

From table 22. it was found that in a post PAR period, farmers have more understanding in nature farming with the statistical significance at 0.01.

4.3.2 Focus group was organized to find out future trend and direction in nature farming.

The participants of this focus group came from 4 parties as follows;

4.3.2.1 Local people consisted of participated farmers, communal leaders, which are the committees of Tambol Council Administrative Organization and village chiefs as well as other leaders.

4.3.2.2 Local public servants consisted of soldier, frontier policemen and staffs and agricultural academics Vocational Training and Development Center.

4.3.2.3 Merchants and businessmen who deal with vegetable trade.

4.3.2.4 Academics and experts on trade and business from royal project, as well as researcher.

In focus group, the main point was the discussion on the future trend and direction in nature farming which could be summarized as follows;

(1) Nature farming should focus on household consumption, product exchange and trading within community. These practices based on royal speech about sufficient economy or self-reliance economy.

(2) Products from nature farming could not receive a reasonable price as expected. Therefore, cooperatives should be established so that communal member not external businessman can directly distribute the products to the market. In addition, the products can receive a good price in the market where consumers have affordable power. However, to achieve that goal, group must be united and they have to ensure that product is consistently available and its quality is maintained.

(3) In the future, if the community would like to do a business in the products of nature farming, the study on packaging and labeling should be conducted in order to credit the products. Therefore, relevant public servants have to play important role to help this procedure.

(4) Procedures in business aspect should start by organizing the meeting between producer and consumer in order to perceive the characteristic of demand, trade regulation, price setting etc.

(5) Production cost must be compared in the long run so that cost analysis can be performed carefully. In addition, the cost of environment and health of farmers and consumers have to be internalized in the analysis of economic return.

Moreover, the participants of focus group particularly farmer group concluded that vegetables providing a good result were *water convolvulus*, *multiply-onion* and *chinese cabbage* as well as *Mustard green*, while the cultivation of *kale* did not work out. The problems were seasonal change, soil condition and seed quality. However, such problems did not obstruct the performance in nature farming but it encouraged farmers to convince such problems and keep going instead.

The increasing of farmers in the community and neighboring community to perform nature farming is the evidence to show the successful outcome of this project. At present, vegetables from nature farming have been harvested for household consumption and the rest have been sold in the local market. Farmers said that at present, they do not buy vegetables from market, because they can harvest and sell vegetables grown in their home garden everyday.

## **CHAPTER V**

### **DISCUSSION**

From the research findings, it leads to a knowledge that can explain PAR concerning on nature farming of the farmers around Thai-Cambodia border areas.

#### **5.1 Findings on Participatory Action Research on Nature Farming of Farmers along Thai-Cambodia Border Areas**

##### **5.1.1 Learning Achievement and the Skills on Nature Farming**

From learning nature farming through PAR method, its finding that the farmers could have development of paradise on their knowledges and skills, which is according with Constructivism theory . the research finds that after farmers have participated in PAR, they understand, learn and have more skills on nature farming. By investigating the pre-test and post test of farmers' knowledge based on authentic assessment as well as learning development portfolio, it is found that farmers have learned from a genuine action, a participation in planning and a participation to solve the problems through PAR method. Their knowledge have been developed step by step until they understand and know full well on what they and their group have done. These findings conforms to Constructivism Theory on the ground that participants would gain knowledge in the process that participants are involved in each circumstance and they will learn and get knowledge by themselves (Human Resources Coordination office, 1997). This theory agrees with PAR concepts believing that the understanding and action which will lead to a change on each individual and

each individual or community's need toward the problems (Department of Non-Formal Education). It also agrees with a research from Mr. Hoare, Tony Richard who cited that:-

*"It is argued that through using PAR methods there will be greater participation throughout the rest of planning process, skills will be built within the community, and the resulting plans will be more relevant the community needs."*

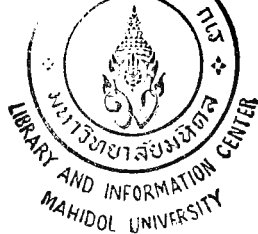
An important technique to build up more knowledge to farmers is to encourage them to analyze the problem by discussion or conduct a sub-group meeting. In these activities, the opinion of each participant as well as indigenous knowledge must be respected. This knowledge forming process conforms to Kamol Sudaprasert's explanation that knowledge forming process of human would be accomplished by analyzing the information, categorizing in each class and then creating a new knowledge. The new acquired knowledge will be compared and tested with the existing knowledge and some aspects are in tuned. This will lead to a sustainable wisdom and thought.

### **5.1.2 Changes of Economic, Social and Environment of Agricultural Households and Community.**

In economic aspects, it is found that after a participation in PAR focusing on nature farming, there is a better change on the farmers' economy. Farmers can save their household expenses by consuming natural products that they make by their own. They also make a profit by selling agricultural products that is over supply to the

market. In addition, they can use seeds of some vegetables to be the seeds for next cultivation. They can save their cost on chemical fertilizer and pesticide by using compost and herb instead. Compost has low cost and farmers can make it by themselves. Furthermore, compost offers longer soil nourishment than chemical substances. Compost will be used only once a year while the chemical fertilizer must be used for every cultivation that might be 3 times a year. To use compost and herb for expelling pest will save our money to import chemical fertilizer and substances, this is an indirect way to help on country's savings. This finding agrees with the research of Sa-ard Yothaphol (1991) who compares a natural farming and new method farming. It is found that natural farming has less cost than new farming method that uses chemical fertilizer and pesticide. It is also in accordance with a study from Jaturong Boonyarattanasoothorn (1994) who compares alternative farming with mono-farming. A case study on Udom Pattana, Nong Bua district, Nakhonsawan province displays that farmers in alternative farming gained more income than farmers in mono-farming because organic fertilizer could save their cost and make farmers be able to depend on themselves.

In social aspects, after participating in PAR, there is a better social development in many levels ranging from family, community and organization. In family level, there is a knowledge transformation between family members. Responsibilities are built up because every member must be responsible to plant vegetable and must take care of household products. In community level, there is an assembly of natural farmer group where farmers can exchange their knowledge and experiences of so-called indigenous knowledge. These activities will make them more united. They will share their products and helping each other. They also learn about



democracy society since members will discuss and exchange their ideas in a discussion, sub-group meeting, and workshop. Members have to share responsibilities to accomplish each work. In the government level, there will be cooperation between farmers and official units, between official units and other official units during PAR activity. This includes military organization, community development organization, agricultural promotion organization, education organization such as Department of Non-Formal Education and District Administration Organization. This cooperation will benefit in saving budget on national development, the work from each different units will not be repetitive and can avoid confusion and tardiness. In addition, some limitation in the operation in official units will be relieved. This accomplishment will lead to highest benefit to people and nation.

The benefits from the integration of farmer group are in accordance with a research from Bampen Kiew-wan (1994) who conducted PAR concerning the participation of local people in the agricultural development and promotion in Pangnga province. From the research; it is found that local organization formed in the village will stimulated social development in the community. Working process and the cooperation of community members will be developed. It also agrees with the research from Wallace, Marcia Lynne (1995) who made a research on PAR : A Role for citizens in Community Development. Based on this research, PAR is the ground for community development and this method is more appropriate in community level rather than in national level. In addition, this outcome conforms to the research of Supaphan Na Bangchang and others (1988) who made a research regarding community development in Cha-cheng-sao province. This research points out that the integration of community members that is anticipated and operated by their own effort

would have a highest potential in self-reliance. The organization originated by community members' needs and supported by other private sector outside will have lesser self-reliance capacity while the organization formed by government will have least potential in self-reliance.

Nonetheless, from this research it is found that military unit plays a great role to the community because this organization must take care communities directly and must stay with communities in a long time. This is because the communities around border line is the area that government must play an important role in development since the communities development is always involved with national security. Here, the organization formed by government has quite high potential and flexibility. It is rarely found organizations supported by private sectors exist in this area.

In environment aspects, it is found from the research that after participating in PAR activities, there is a better environmental development than before both in community level and household level. There is a reduction in chemical substances and fertilizer because farmers turn to use animal excrement and weeds as compost as well as to use herb to eliminate pest. This process will reduce importing poisonous chemical substances to the country and it is also a start for sustainable agricultural development. In household level, the planting area is expanded for nature farming so that household members have lesser risk to obtain poisonous substances in agricultural process such as by spraying pesticide as well as consuming food. Thus, farmers have a better health and this is a benefit to community environment development as a result from PAR method. This agrees with the research from Bampen Kiew-wan (1994) who found that PAR would give benefits to the

organization in the village especially in natural resources development and environment. The development of resources in community is relevant to income and economy development as well as social development. In this case study, military unit gives an opportunity to farmers to join in agricultural area expansion project so that community can exploit the land to get highest benefit both in terms of land usage and environment. This is also conformed to the research from Col. Somsak Sanyakamthorn (1987) who made a research to assess the project of self-defense village at Thai-Cambodia border in Prachinburi province. It is found that farmers in border area should exploit the uncultivated land to gain more benefit. Many wastelands are not fully used because of poor land as well as water condition, and unsafe situation in that area. There should be a support to give occupational knowledge to local people because at the moment the cultivation and farming in that area is not appropriately and properly used.

## **5.2 Observations to Apply PAR Method to Development in Other Areas**

5.2.1 In PAR method, though the planning is cooperated by every party in every process, there is still an unexpected incident that may affect to the success or failure of this activity. Thus, the researcher and developer should have contingency plan and flexibility to handle this situation based on way of lives in community. An example from this research is that 3 farmers could not join the research until it was finished though they had joined this program voluntarily. These 3 farmers had another activities that interrupted them to join the program. The first farmer was a village headman or official community leader. He wanted to join in this activity because he had many experiences and wanted to be a good example in the society. However, in reality community leader was the representative to join a lot of activities in

community. He had to attend the meeting concerning politics, administration and the development of community in border area. In addition, he was given a special assignment from military unit because Tubtim Siam 05 project village was a self-protection village and this village would be governed differently from other villages due to its strategic significance in national defense. Community leader had to be the representative to cooperate with many government offices so he was not able to join the program continuously. Nonetheless, his intention to join this program and his cooperation in a few period shows that the community leader himself is interested and realizes the significance of nature farming. The second farmer was not available because he was assigned by military unit to build cowshed during the period that nature farming was being executed. His family had to join building the cowshed also. Thus, they could not join our program continuously. The third farmer just got married and was pregnant during the program. Apart from her health condition, her husband was working in another province so there was not enough workforces in this case.

In addition, there were unexpected incidents to interrupt the workshop. During the workshop, a son of a farmer joining in this program died in an accident. So his family members and neighbors had to join the funeral held in another village where temple was located. That village was about 10 kilometers in distance from this area. From such problems, the researcher tried to solve the problems in the first step by asking family members to join the program. Nonetheless the aforementioned 3 farmers and their family members could not join this activity but they also observed the execution in the program so that they could make it later. This is considered as a real way of lives in society. To work in communities, researcher should be flexible and understood way of lives of local people. This agrees with the research of

Col.Somsak Sanyakamthorn (1987)-making an assessment on self-protection village project in Thai-Cambodia border. It is found that projects to be executed in self-protection village must be considered in the problems that may occur in reality since villagers may have something that is more urgent or important to interrupt the program.

5.2.2 The significance of military unit in PAR made in border area : it is found that military unit is one of the most significant organization to integrate people in the community and can make them feel secure. The village where this research is conducted is a self-defense village and this area is very sensitive to national security. Total self-defense villages around border in Sakaeo province are 17 villages. Therefore, to make any development in such communities, researcher must communicate with military in such area because military units play a great role in determining the success or failure of any activities done in this area.

5.2.3 Continuity of development organization : the continuation and continuity as well as the commitment of the officers to cooperate with villagers will make them confident and this key will lead to the accomplishment in the program. At this moment, it is found that many organizations had tried to make development in such area but failed and gave blame on villagers. In the other hand, from villagers' point of view, most of officers did not develop the village continuously. A farmer complained before joining this research that

*“Many officers had come to develop our village but then left. Some left debts to us well... .. Though we came to the meeting and*

*listen, it did not mean that we believed it. We didn't want to displease our superior....."*

The previous developments from government officers made some doubts to villagers. The development in general was not continuous and was lacking of good cooperation and planning. This is a waste of budget, time and human resources. Furthermore, it can not make people be self-reliance and the community is still weak. The continuity of development organization from government is an important to determine the success of failure on the development in village level.

However, from the research in this case, government officers co-operate with villagers continuously. The commitment of the officers not only gives the benefit to farmers joining in this program but also the other farmers in the village. Moreover, the nature farming is also expanded to neighboring villages.

5.2.4 Flexibility during the program : To introduce nature farming to farmers, researcher must study indigenous knowledge first and then harmonize the indigenous knowledge and the new idea gradually. The combination of 2 ideas must be flexible, not obliged but must be continuous. It should start from the voluntarily group and then roll out to other groups. To run the program, researcher should discuss with villagers in every progressive step to make them understand. The most important thing is to respect indigenous knowledge and be mingled with the way of lives in community. The modern agricultural process had overwhelmed the lives of farmers for a long time. It was difficult to change them to hold on to nature farming because the farmers were not confident and did not want to risk damage that may occur in nature farming. As a result, farmers refused to do it or only a few. Some of them

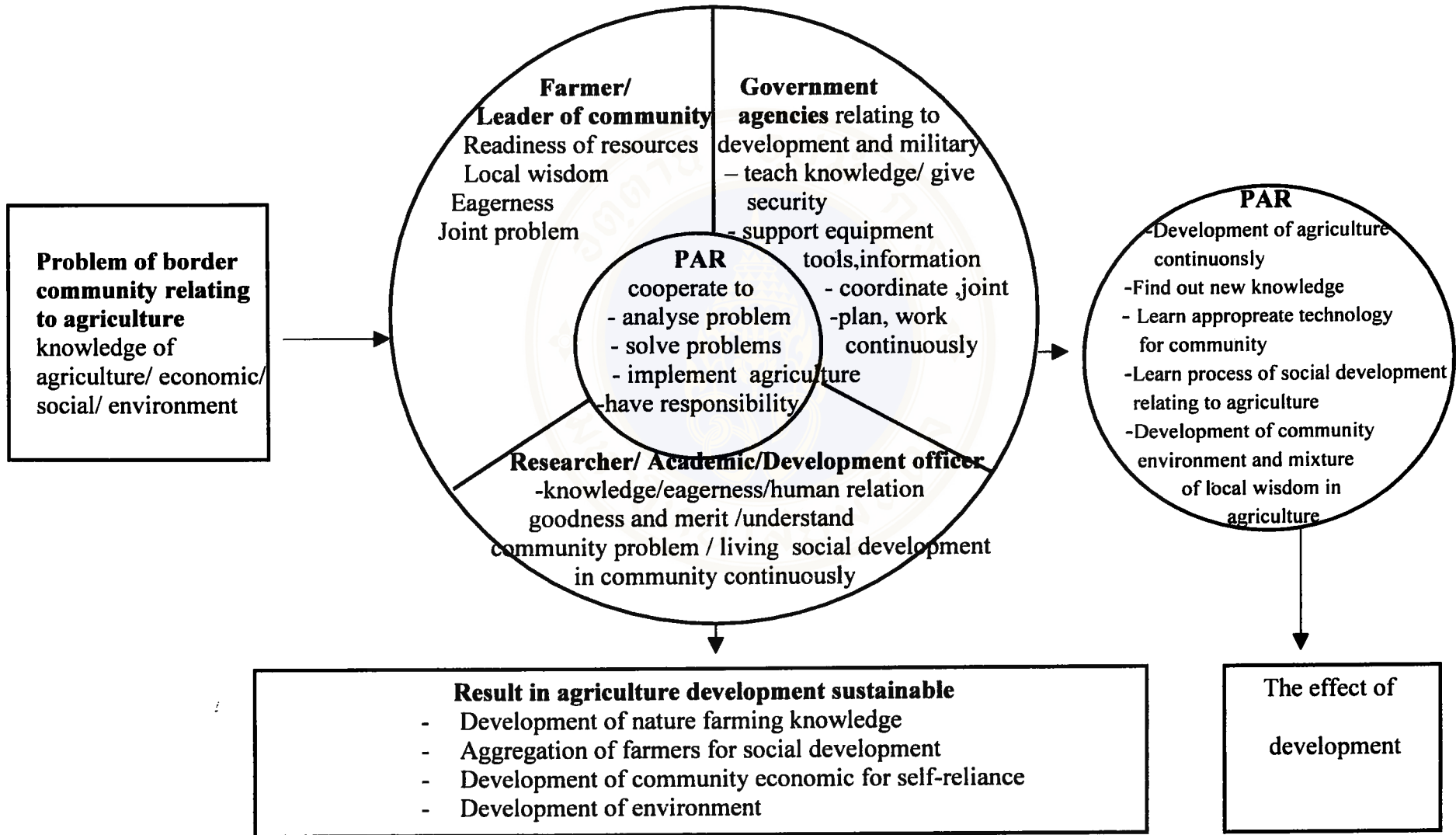
would wait and see how their neighbors succeeded in joining this program before making a decision. Once they had tried and experienced this method, they would choose by themselves to continue or stop it. From the observation, though there were both success and failure to plant the selected vegetables, for example, kale planted by this method was not productive, the farmers brought out this subject to analyze and find out the cause of failure. They assumed that it was due to the inappropriate season because it was the rainy season at that time. In addition, land condition and planting process might not be proper. The way that farmers cooperated and joined in analyzing the problem would make them learn and gain more experiences. The failure that they faced will stimulate and encourage them to be active and to experiment another planting in the next appropriate seasons. This phenomenon agrees to the basic concept of PAR that the origin must be from community's problems.

In addition, PAR process must be dynamic, lively, moving, flexible and adjustable. It must be accomplished on the ground that everyone has the potential and capacity to think and work together and indigenous knowledge must be respected. (Department of Non-Formal Education, 1995) Another observation in the research shows that the continuous commitment of officers involving in the development is a key to the success to encourage farmers to believe and accept nature farming. Up till now, it is found that nature farming has been rolled out in the community and neighboring villages. This result conforms to the research from Supoj Chaivimol (1990) who studied the factors that influenced the acceptance of the farmers on making and using compost in Tapan-hin district, Pichit province. From this research, it was found that the communication with government officers was an influence to the farmers to accept making and using compost. It also agrees with the research of Sirirat

Bamroongkorn (1989) Concerning on the factors involving in the acceptance of non-acceptance of innovation in the case study of farmers in Pattani province. The research suggests that the communication with government officers is a factor that influences the acceptance or non-acceptance of innovation.

5.2.5 Based on this research, PAR is an appropriate method to be applied in occupational development for people so that they can learn and understand. This will stimulate a better change on economy, society and environment. Therefore, the organizations involving in rural development, occupational development and mostly working with less-opportunities people, for example Department of Agricultural Extension of Department of Non-Formal Education, should apply PAR method in their development on economy, society and environment, particularly in the economic crisis period. The development of human resources to understand PAR will originate the sustainable development in the society.

It is found in this research that PAR method will enable the community to learn and solve the consequential problems. This can be ensured that PAR learning is a sustainable learning. Particularly, the learning of educational environment will affect the sustainable development in the aspects of economy, society, environment, politics, government as well as the national security at the border. All the results in this project have been analyzed and summed up as a model of the learning process on nature farming which is a part of sustainable development in agriculture.



**Figure 10** Use of Process of Participatory Action Research for Sustainable Agricultural Development in Border Community

Copyright by Mahidol University

## CHAPTER VI

### CONCLUSION AND RECOMMENDATIONS

#### 6.1 Conclusion:

This participatory action research (PAR) on nature farming for agricultural households in Thai-Cambodia border areas is a research and development using PAR method. The objective of this research is to study the achievement of farmers' learning in nature farming as well as the skills and occupational development of the households around Thai-Cambodia via PAR method. Next is to compare the characteristics of economy, society, and environment of the household before and after participating in PAR. Research methodology will mainly rely on qualitative research and using quantitative data to support in analyzing results of the research.

Sampling in this research consists of people in 3 groups which are 30 farmers in Tubtim Siam 05 project village, Project 8 of aged man and community leader and 8 of government officers working in this area, i.e. academics from Vocational Training and Development Center of Thai People along Sakaeo border, soldiers and other relevant officers.

PAR process was classified into 3 phase : Pre-research phase, Research phase, Post-research phase. In pre-research phase, research tools were indepth interview, participation observation, group meeting, pre-test, attitude test, and general information of the participated farmers. Tools in research phase were conference, focus group discussion, portfolio, participated and non-participated observation. Tools

in post-research phase were post-test and conference. Results of the research can be concluded as follows :

### **6.1.1 Pre-Research Phase**

#### **6.1.1.1 Characteristics of community in the research**

The community in this research was purposive sampling, focused on the village that is affected and damaged by fighting at Thai-Cambodia border, and environment in the village had deteriorated as well. The selected village was Tubtim Siam 05 Project Village, located at Klongkaituan sub-district, Klonghad district, Sakaeo province. This village is a self-protection village to strengthen national security. It is adjacent to Cambodia at Panom-pruek district, Pra-ta-bong province. This village was established by Her Royal Highness Princess Chulaporn with the aim to strengthen national security at the border. This is a small village consisting of 139 households and 596 people. The number of male and female population is comparatively equal. Most of them immigrated to this area to find more fertile land. Mainly are from lower northern region, followed by northeastern region. Some of people are native Sakaeo residents.

The main occupation of the people there is planting. The economic crops are corn, soybean, millet, cotton, sunflower, and cassava. By considering economic status, they are relatively poor. The income per capita is only 14,600 baht per year that is lower than the standard set by The Community Development Department.

Main natural resources in the village, which are soil, water and forest, has largely deteriorated. A principal water resource in the village is Klongnamsai canal that is a water source for agriculture and is a border line to separate Thai and Cambodia. Formerly, a valuable natural resource of the village was a variety of trees

in the forest where *Lagerstroemia*, and *Dalbergia* were grown. However, the forest has deteriorated. The fertility of soil is at a normal level but needs more nourishment for agriculture.

#### 6.1.1.2 Characteristics of farmers joining the PAR project

Farmers joining in this project consisted of 30 members from 30 households categorized into 19 men and 11 women. The average age was between 31-40 years. The education level was high elementary school. Most of them were married and were family leaders or his spouse. The main occupation for these farmers was planting. The average income per household was 53,464.33 baht per year. Most of them did not have savings but owed debts in average 11,100 baht per year. However, their serviceability was around 8,034.37 per year.

In social aspects, most of the farmers joining in this project were members in a social organization in community and 93.33% of them were members of saving cooperatives. In addition, all farmers joining in this project had never cooperated in developing their own community in the last year. Farmers would like to establish a temple in the community because there were no temple or monastery in the village. The spiritual development was also needed in the society.

In planting experiences, it was found that most of farmers had experiences in planting vegetables around 1-3 years. 50% of the planted vegetables were for household consumption. Vegetables were planted once a year. Winter was the best season for planting but farmers found that vegetables could be sold at a good-price in summer. They gained no profit from planting vegetables last year but they could reduce their household expenses by consuming the vegetables planted in

the household . Distribution method of the planted vegetables was to sell through middleman who came to buy agricultural products in the village.

In environmental aspects, farmers joining in this program possessed 10 pieces of land equally. This land was distributed from military and the farmers could rent additional piece of land at the rate of 100 baht/rai/year. Main source of water in agriculture was from rainwater. To improve soil quality and dispose weeds, most of the farmer used chemical substances and chemical fertilizer. On average, farmers had experienced using chemical substances around 5 years. In addition, it was found in the past year that 50% of farmers were affected by toxic chemical substances used for agriculture. To use remnant materials to better the quality of soil, farmers used soybean hull and animal excrement to be mixed and ploughed with soil cover.

#### 6.1.1.3 Attitudes and Requirements in Nature farming of Participated Farmers

Most of the farmers had positive attitudes towards nature farming. They would like to have their families and themselves consume natural-grown vegetables. They needed the help of government units to promote and educate them about nature farming. They would like to make nature farming in their own land and suggest that there should be a group forming to plant natural-grown vegetables in the village. Furthermore, they were willing to pay more to consume toxic-free products. However, farmers considered that the market price of nature farming products was relative low. They also believed that the chemical fertilizer agriculture could be ensured in productivity. To use chemical substances was more convenient and could offer higher productivity. They also viewed that vegetables planted in nature farming were not nourished well.

In attitudes towards nature farming, farmers had some doubts on it. They didn't know if the toxic-free agricultural products sold in the market were genuine or not. They also wondered if the nature farming would offer higher productivity. They had doubts if vegetables planted by nature farming method could be sold at a better price. They were unsure if nature farming to be executed would make a change on conventional agriculture or not. They were also not sure that after joining nature farming project, they would continue nature farming or not.

### **6.1.2 Research Phase**

The activities made in the research phase is the cooperation between farmers, community leader, agricultural academics from Vocational Training and Development Center for Thai people along Sakaeo border areas, relevant government officers in the area and researcher. There were 7 steps in this period, which were group vision settlement, task assignment, job description, goal achievement, strategic planning, implementation and assessment, conclusion from participatory and non-participatory observation and well as review the authentic learning in portfolio. These steps can be summarized as follows:

#### **6.1.2.1 Group vision settlement**

A tool used in this step was conference. People attending the conference were 30 farmers who participated in the program, community leader, military, government officers in relevant area, agricultural academics from vocational training and development center as well as the researcher. From the conference, focus group discussion could be summarized as follows.

(1) Farmers would form a team to learn planting vegetables in nature farming process and group members would participate in the development as well.

(2) Farmers would plant vegetables by nature farming for consumption in community and for sale at reasonable prices so that farmers could earn more income per year.

(3) This method would improve the quality of soil and water in the community. Overall environment in community would be better.

#### 6.1.2.2 Task assignment

Tool in this step was focus group discussion. Attendants were participated farmers, military, agricultural academics from vocational training and development center, community leader and researcher. The group was divided into 5 sub-groups and each group had to brainstorm to set the responsibility to be matched with the agreed vision and each task must be proxy approved by the group. These were the responsibilities of relevant officers, military, researcher that were focused on participated action. The main responsibility were given to farmer as follows:

(1) The group would cooperate in planting natural-grown vegetable to produce non-toxic vegetable and this will better the health of community members as well as to reduce the expense.

(2) The group would better the environment in community by using natural remnant material in agricultural process..

#### 6.1.2.3 Job Description

Tool in job description was focus group discussion conducted to brainstorm the idea of the group to analyze the strength, weakness, opportunity and threat (SWOT). attendants in the meeting consisted of participated farmers, military, academics from vocational training and development center, community leader and researcher.

After analyzing strength, weakness, opportunity and threat, the group would consider the main mission. It was concluded that the main mission in the group is to plant natural-grown vegetable that have more potential and opportunity to reach the accomplishment. There were more strength and opportunity than weakness in this area.

#### 6.1.2.4 Goal achievement

Tool in this process was focus group discussion. The attendants were divided into 5 groups which were participated farmers, military, academics from vocational training and development center, community leader and researcher. The target could be concluded as follows:

(1) Educate and develop skills in planting natural-grown vegetables to participated farmers with in 3 months. The participated farmers would be the center to develop this knowledge to community

(2) In nature farming, farmers could reduce cost of planting vegetables.

(3) There was a group forming to plant natural grown vegetable in order to develop community and environment.

(4) There was a cooperation in community in all levels ranging from community leader, officers in the area and researchers.

#### 6.1.2.5 Strategic planning

The main strategy was the cooperation of every party to brainstorm, operate and solve problem until the work was accomplished. The farmer was the one who made the planting while officers and researcher joining in this project would coordinate to make activities. They would also educate and join in solving the

problems that might occur. The way to solve problem should be conformed to indigenous so that it would be accepted and applied in the community in long term.

#### 6.1.2.6 Implementation

The implementation was the cooperation between participated farmers, officers in the area, academics from vocational training and development center as well as the researcher. In every step, there would be discussions from all parties. The timeframe to accomplish this task was within 6 months, started from August 1999 to January 2000. There were 9 activities to be accomplished which were tour investigation, educating nature farming theory, land preparation, selecting vegetable seeds, breeding rice seedling, removing seedlings, nourishing grown-vegetables, harvesting and making portfolio. Each activity could be summarized as follows:

(1) Observation tour : The place for tour study was Suranakorn Central Market that was a major vegetable-trading center in northeastern region. The experience from this tour investigation would give farmers an overview of retail and wholesale market of vegetables.

(2) Teaching knowledge of nature farming: It was agreed that there would be formal group meeting at least once a week at the village governor' house. Anyway, the informal education would be made in the workshop. Volunteer teacher at the village and researcher were the medium of the cooperation between agricultural academics and farmers.

(3) Preparation for vegetable plot: After farmers had been educated in basic knowledge of nature farming, they would prepare the land for planting under a close supervision of agricultural academics and working team The farmers had faced different problems ranging from land conditions, soil conditions and misunderstanding

in land preparation process. These problems would be discussed after examining land preparation and the correct steps in land preparation would be demonstrated to farmers.

(4) Selection of vegetable breeder seeds: Each farmer selected the seeds by himself according to his experiences, skills and requirements. Farmers from Klonghad district could supply all of the seeds required by participated farmers. In addition, agricultural academics also suggested the farmers to select good quality seeds.

(5) Cultivation of young plant; Farmers bred rice seedlings by 2 methods. The first was to sow seeds and after the seeds had grown, they would pull out the weak or too tight rice seedlings. The second method was to plant the seedlings in one area and then removed the strong seedlings to another piece of land. During this period, farmers would confront with the problem from pests or un-grown seedlings planted by some farmers. These problems were brought up and discussed by sharing each experience. Agricultural academics also advised the farmers to use herb in order to prevent pests according to natural agricultural method. They also educated farmers to remove the seedling to avoid vegetable diseases and pests in the breeding area and taught farmers the techniques to breed some different seedlings so that the farmers could experiment it later.

(6) Plant transferring: Farmers would remove the seedling when it was strong enough-about 3 - 4 week after breeding in average. The distance from each seedling was about 20 - 30 cm . Some farmers did not remove the seedling because they used another method. They sew all seeds to the land and after seedlings were

grown, they will pull the tight seedlings out. Some vegetables did not need seedling removal, for example, scallion, coriander and cucumber.

(7) Nourishing grown-vegetables: Each farmer would plant different kind of vegetable. However, each kind of vegetable had similar growing period. When the vegetables were not fully-grown, the problems found in this period were rotten roots and fungi in vegetables. This was resulted from heavy rain in such period. Moreover, most of the lands were clay so the water was stagnant on the land. As a consequence, the vegetables of some farmers are damaged or offer less productivity. By the way, the vegetable that gives the highest productivity is Chinese morning glory, followed by scallion. Throughout this process, sub-group meetings were hold to exchange the ideas of the participants in the program.

(8) Harvesting vegetables: Vegetables from different farmers were harvested at similar time. Nonetheless, some farmers had to harvest the vegetable before it was fully-grown because the vegetables were going to have rotten root due to the stagnant water after heavy rain. The harvested products were consumed in households and distributed to neighbors or processed to be another products. Some vegetables were sold in the market.

(9) Marking portfolio: There were 2 portfolios, which were farmer portfolio and project portfolio. The farmer portfolio would be recorded the memorandum of farmers in planting vegetables by nature farming method, expense in planting vegetables. It was also recorded the obstacles and the solutions in planting nature farming. From the portfolio, we would know that farmers understand nature farming process gradually from their own experiences. The investment cost was less than the income from selling vegetables. In other words, the income from selling

vegetables was 24,000 baht and farmers could save their expenses to buy vegetables in the market for one-month consumption period estimated at 24,000 baht while the cost to plant vegetables in at 35,322 baht. The obstacles in planting natural-grown vegetables were the inappropriate land condition-it was clay, hard and unnourished. There were not enough spaces in the land and the size of the land was not proper. Water was stagnant in the land. The selected seeds did not suit the rainy season. In addition, farmers were lacking of experiences in planting vegetables. Other problems were not fully-grown coriander, vegetables damaged by pests or animals, vegetable diseases, and untimely harvested vegetables that would have less weight and were not beautiful. The way to solve the problem was to follow each responsibility that was to discuss with academics or the farmers themselves and help each other taking care of the land.

In project portfolio, there would be photographs showing the development of farmers on nature farming, charts demonstrating the execution and performance as well as the record of participatory and non-participatory observation. From this portfolio, it was found that each farmer had a development in learning nature farming and could operate it in every step. Farmers and involving parties would share the ideas to solve each problem. The farmers could accomplish the activities in every process though period in some activities were extended because each farmer started his activities at different time. From 30 farmers participated in the program, 27 farmers could execute all activities set in the program. The remaining 3 farmers could not join in all activities because one farmer was engaged by his mission as a community leader, the other one was engaged by urgent assignment from military. The last farmer had health condition due to her pregnancy.

### 6.1.2.7 Assessment

The assessment from portfolio is authentic assessment. It is found that the leaning development of farmers participated in the program is in positive direction. This development stimulates a positive change on economy, society and environment. Farmers can gain more income from selling vegetables than the expense. They can reduce their daily expenses by consuming vegetables planted in their household. In social aspects, farmers in the village are united to help each other. There is a tendency that the farmer will establish nature farming group. In environmental aspects, remnants such as animal excrement and weeds are used to cover soil surface. In health issues, chemical substances remaining in the vegetables or obtain the toxic substances during spraying chemical substances after they have made nature farming.

### 6.1.3 Post Research Phase

In post research phase, it is found that farmers have more understanding in nature farming. From the assessment from the post-test focusing on farmers' understanding in nature farming, farmers have gained better understanding with 0.01 statistic significance. Conferences were conducted for relevant parties including merchants and academics to find out the direction and trend to execute nature farming in the future. It can be concluded that farmers should focus in producing vegetables for consumption in household and community. The execution should be considered in safety first and then focused in self-reliance economy conformed to the King's initiation. Farmers should assemble in cooperatives to distribute products in to the market. In addition, farmers should be able to continuously produce quality products. Packaging should be proper and stamped with the reliable source of product. The relevant government organization should support in this issue and should make a

discussion with entrepreneurs in the aspects of product demand, trading regulations and price negotiation. Long-term production cost comparison should be examined so that the production cost can be analyzed thoroughly. In addition, the environment and health of people in society should be concern as well.

#### **6.1.4 Knowledge of the Farmers Participated in Participatory Action Research**

##### **(1) Before PAR**

In this research, pre-test was used to measure the understanding in nature farming of the farmers. Before joining in PAR program, the average score that farmers could make was at 6.67 from total score of 15.

##### **(2) After PAR**

In the post-test after PAR program, it was found that farmers participated in PAR could make higher average scores to 12.74. By t-testing, the statistical significance was at 0.01. This showed that after farmers had studied the natural agricultural agriculture via PAR, they learned more when they did it themselves, solved problem, analyzed the problem, cooperated in the group, discussed in the conference or sub-group meeting.

#### **6.1.5 Skills of Farmers Participated in Participatory Action Research**

##### **(1) Before PAR**

From the questionnaire, it was found that farmers had experiences in planting vegetables about 2 years in average. These experiences were in the fields of land preparation, selecting seeds, breeding seedling, removing, nourishing and harvesting. Some indigenous knowledge from these experiences agreed to MOA

nature farming while some did not. From the questionnaire, 80% of the farmers participated in this program had used chemical substances for agriculture.

## (2) Post PAR

Farmers had more understandings and skills in making nature farming. These understandings were originated from discussion to exchange ideas, tours, investigation, education by agricultural academics, jointly analyzing community problems. Jointly execute the project, and collectively taking care of group's benefits. The process to create the understandings was accomplished by the cooperation from 3 parties which were people in community, developing officers both from military and civil servants, and researcher who stimulated continuous activities.

By considering the learning development of farmers from the portfolio and photographs taken during the program, it was found that farmers gained the understandings and skills in making nature farming in every step gradually from the real experiences. They could make it and had learned to jointly solve the problems during the program. The farmers could follow all the plans set in every step. This made them understand and can make nature farming in correct procedure. This also enabled them to solve the problems happened in real situation and would also make them feel confident to run this program by their own. In general, the learning development of farmers was in a positive direction.

### **6.1.6 Changes on Economy of Farmers Participated in Participatory**

#### **Action Research**

##### (1) Before PAR

In terms of income, expense, profit and loss: it was found from the questionnaire that before the program, farmers could sell vegetables at only 1 - 2 baht

per kilogram. They did not have any profit from selling vegetables because the price was pressed by middleman. In the last year, the average income from selling vegetable was only 1,426.33 baht/month per each household.

In terms of changing on cost, it was found from the questionnaires that farmers normally used chemical fertilizer with the formula 15-15-15 and urea fertilizers. The fertilizer cost in the land equal to land for nature farming (12 sqm.) was 100 Baht. To plant vegetables each time, this amount of fertilizer or more would be needed. If vegetables were planted 3 times a year, the cost for chemical fertilizer would not be less than 300 Baht. In addition, more cost would be added on pesticide and weeds killer.

## (2) Post PAR

In terms of income, expense, profit and loss, it came to a positive direction. This was considered by the fact that farmers could earn more revenue than their expenses. The revenue was accounted for the income from selling nature farming and the saving from consuming vegetable planted in the household instead of buying. The overall cost of investment in this program was 35,322 Baht while the income from selling vegetables in 2 months totaled 48,000 Baht. So the net income was 12,678 Baht or 6,339 Baht per month. If 27 farmers families participated in the program turned to plant vegetables as their main occupation in the land equal to the experiment land, each household would gain income not less than 2,817.33 Baht/month. In addition, in the harvesting time, farmers could save by consuming their own products in 2 months was 48,600 total. The oversupply vegetable would be preserved, some would be kept for propagation.

In term of changes on investment cost, it is found that it is worth in long term investment. Comparing the cost of investment in the same size of land (12 sqm.), in each year farmers bear cost of compost at 150 baht and chicken manure at 20 baht, totaling 170 baht per year. Vegetables can be planted 3 times a year without any extra cost on fertilizer. Thus the average cost for fertilizer is only 57 baht in each cultivation. Farmers can save cost in land preparation and fertilizer in next cultivation because the existing land is friable and is fertile. Farmers can plant vegetables in next cultivation by not adding more fertilizer so they can save the cost. On the other hand, by using chemical fertilizer, farmers can not save their cost on vegetables planted in next cultivation. In addition, after the program was accomplished, most of the, farmers participated in the program continue to plant vegetables in the old land but plant more kinds of vegetables to meet household's need. Some households plant more than 10 kinds of vegetables. The oversupply vegetables will be sold and they can earn money 20-30 Baht a day.

#### **6.1.7 Changes on Society of Farmers Participated in Participatory Action Research**

##### **(1) Before PAR**

From the questionnaire, it was found that farmers in Tubtim Siam 05 Project village had never formed the nature farming group before. Moreover, it was not found that any government organization had come there to promote nature farming earnestly and continuously. So the farmers did not have any experiences to form a group to manage the business of nature farming in the village.

## (2) Post PAR

In terms of social changes, it is found that after PAR program, there is an integration of farmers for nature farming. Farmers help each other in making nature farming, they are united and always exchanges ideas to find out the solution they have faced. They also exchange their products together and some products are distributed to neighbors and relatives. They also have established other social units related to PAR program such as a group of compost makers. The objective of this group is to produce fertilizer for nature farming in the village as well as for selling to other villages nearby if they are interested. In addition, they discuss to establish a cooperative for nature farming to distribute their products in the market, especially local market. There is an allocation of work in nature farming ranging from planting to selling. This work tends to be continued further.

For the cooperation between parties, it is found farmers and other parties in that area can work cooperatively in running nature farming program. Without any charges. Military in the village allocated 10 rais of land located near the river to farmers participated in the program and other people interested in planting vegetable. The only condition is that farmers must make it earnestly and effectively. Military units will follow up the progress continuously during the period farmers plant vegetable in that area. There are many households joined in this program and at the same time, military units also plant vegetable around that area an military land.

### **6.1.8 Environmental Changes of Farmers Participated in Participatory Action Research**

### (1) Before PAR

In environmental aspects, in general farmers were acquainted to use chemical substances. From the questionnaire, it was found that up to 80% of farmers used pesticide and had experiences in using chemical fertilizer and chemical substances for agriculture around 5 years. Each household had an expense to buy chemical fertilizer about 2,456 baht per rai. In addition, they did not use remnant materials effectively. Only some of bean hulls, animal excrement and millet were used to cover soil surface. No household owned any land for nature farming

### (2) Post PAR

In terms of changes on environment, it is found that farmers participated in the program tend to reduce using chemical substances for agriculture. They turn to set a team to produce compost for using in the village and for selling. They also believe that compost will improve quality of soil to be more friable and fertile. In addition, they recycle the wasted material such as bean hulls, animal excrement, and young maize stem to make compost. To get rid of pest, farmers use herbs such as Sadoa (*Azadirachta indtca*) as well as soap water or vinegar. The farmers also expand land for nature farming by using 10 rais of land offered by military units to plant more vegetables such as cabbage, Chinese kale, cucumber and chilly. Though some other farmers do not expand agriculture land, they still plant vegetable by nature farming method in their household because they believe that it is safer than to consume vegetable sold in markets. Farmers also have a better psychological condition - they feel good that they themselves and their family can consume the vegetables planted by nature farming.

## **6.2 Recommendations from the Research**

6.2.1 From this research, it is found that the participatory action research can educate and enhance skills in nature farming to farmers. It also stimulated a better change on economy, society and environment. As a result PAR is considered as a social learning model. Thus, to supporting an education to farmer, the organizations concerning in the development - such as Department of Agriculture, the Community Development Department, Environment Concern Organization, Public Health Organization as well as Educational Organizations responsible to develop the occupation for less- opportunity people and people around the borders - should be trained to understand PAR method. By this way, they can use this method to make a plan and development. This method also stimulates the learning development in the target group. In addition, this method should be used for national development in other aspects, started from communities in villages to make them self-reliant and then roll out to regional level and then to national level.

6.2.2 From the research, it is found that PAR method can be applied effectively in developing the occupation on nature farming. So it is suggested that other border areas in Thailand that have faced the problem of environmental deterioration or national security should apply PAR method to stimulate sustainable agricultural development. PAR should also be applied to other developments on nature farming appropriate in each area such as planting fruit, rice field and farming. The will strengthen the community and better the environment.

6.2.3 From this research, it is found that an important factor to accomplish the development in community is the cooperation with other involving government units especially military unit. The village where this research was done is a self-

defendant village at the border and is supervised by military. As a result, this village is full of discipline as like as military village. In addition, members in this community always cooperate with other government organizations. The continuity of government officers' performance plays a great role to the accomplishment of this development. Therefore, to enhance the development to other villages in border area, the good cooperation with other organizations must be considered especially with the organization concerning national security or military. Most importantly, the success of this program requires close cooperation with local organization

6.2.4 To accomplish the targeted task in PAR, performance standard should be determined as a base for members to reach the target. The performance measurements are such timing, Productivity per unit and a decreasing cost per agricultural unit

6.2.5 Other knowledge concerning the way of lives of the farmers should be taught together in PAR process such as the knowledge on forest protection, energy saving, cost of investment and product distribution

6.2.6 The result from this research should be applied to determine a policy or direction in socio-economy development of the country in the future.

### **6.3 Recommendations for Further Research**

6.3.1 From the research, it is found that PAR plays a great role to the accomplishment in educating and enhancing skills in nature farming to farmers. This is an effective way to educate environmental study to community. Thus, PAR should be applied to introduce other environmental studies to community such as forests protection, energy saving, water sources development and garbage disposal, eco-tour promotion or to introduce environmental studies to people in slums.

6.3.2 From the research, it is found that farmers participated in the program have experienced a better change on economy, society and environment. They still continue their work though the program was ended. Therefore, PAR should be applied to other target groups especially community leaders - such as district administration organization, environment volunteers, female group leader or youth group leader - to make them as key persons to stimulate environmental development. PAR will also encourage community leaders to realize and cooperate in environmental development in communities. It is believed that if PAR is applied by strong community leaders, its success can be rolled out and it will create continuous sustainable development in communities.

## BIBLIOGRAPHY

- Apiradee Komolsiri. (1987). Factors Influencing the Adoption of Producing and Using of Compost Canure among Farmers in Khao Yoi Petchaburi Province. M.A. Thesis in Science (Agriculture), Department of Agricultural Extension, Kasetsart University.
- Barlett,P.F. (1987). "Industrial Agriculture" Economic Anthropology. In S.Patter (edited),California University.
- Boonchom Srisaard. (1992). Basic Research (The third edited). Bangkok: Suveeriyasarn.
- \_\_\_\_\_. (1995). Statistics for research. (The second edited). Bangkok: Suveeriyasarn.
- Boonkerd Budta. (1981). Factors Relating to the Adoption of Agricultural Technology in Thailand. The Journal of Agricultural Economic Research (4 August 1981) P 16-23.
- Boontham Kitpredaborisuth. (n.d). Techniques to Construct Tools in Information Collection for Research. Nakhonpathom: Faculty of Social Science and Humanity, Mahidol University.
- Bumpen Kiew-wan. (1994). The Report on Participatory Action Research of Local People Organization in the Development of Agricultural Extension in Pang - nga Province. Bangkok: Department of Agricultural Extension Ministry of Agriculture and Cooperatives.

- Bureau of Human Resources Development Project. (1997). Manual of Local Curriculum in Ubonratchatani. Ubonkit Offset Printing.
- \_\_\_\_\_. (1997). Training Manual on the Utilization of Student's Portfolio. Bangkok: Netikul Publishing.
- Bureau of Human Resources Development Project Co-ordination. (1998). Training Manual of the Formulation of Strategic Planing. Bangkok: Ministry of Education.
- Cartwright, D.(1949). "Some Principles of mass Presuasion" Human Relations. 2 :253-267.
- Chairoj Thanasanti. (1992). The Participation of Tambol Council Committees in the Conservation of Natural Resources. MA Thesis, Department of Rural Development, Graduate Studies, Mahidol University.
- Chamnong Adiwattanasithi. (1980). History of Social Science Ideology. Bangkok Odeonstore Publishing.
- Chanuan Rattanawaraha. (1991) Sustainable Agriculture: Agriculture and Nature. Bangkok. Department of Agriculture. Ministry of Agriculture and Cooperatives.
- Cherdsak Chumnoom. (1997). The Report of Research on Information Applying the Techniques of Participatory Action Research: The strategy Development in Qualitative Approach Ban Ta-Makarm School Tambol Tanowsri Amphore Suanpeng Ratchaburi Province. Bangkok Netikul Publishing.

- Chom Innurak. (1997). The Roles of Farmer in Sustainable Development: A Case Study of Mr. Khieng Kongkaew, M.A. Thesis in Arts, Graduate Studies, Mahidol University.
- Cohen, Bruce J. (1997). Introduction to Sociology. New York : Mcgraw. Hill Book Company. P.35.
- D.B. Grigg. ( 1987) . ' The World Food Problem ' in M. Pacione London: Progress in Agricultural Geography.
- Decha Siripattara. (1990). Conscious Agriculture. Bangkok. Komol Keemthong.
- \_\_\_\_\_. (1987). Present and Future of Alternative Agriculture in Thailand. The Journal of Appropriate Technology, 5, (March-June, 1987) P 3-4.
- Department of Agriculture, Ministry of Agriculture and Cooperatives. (1996). The Eleventh Seminar on Farming System "A system for Farmer, Environment and Sustainability" held on 12-15 of March, 1996. Cha-Am Regent Resort Amphore Cha-Am Phetchaburi Province.
- Department of Environmental Quality Promotion. (1999). Spatial Environmental Database in Sakaeo Province. Bangkok, Division of Environmental Information. Ministry of Science, Technology and Environment.
- Department of Forestry. (1997). The Implementation to Solve the Problem on Forest and Land. Department of Forestry. Ministry of Agriculture and Cooperatives. Mimeographed.
- Department of Land Development. (1994). Tubtim Siam Project in Sakaeo Province. In the Proceeding of Planning for Enhancing the Opportunity of Production, Employment and Business, Sakaeo: n.p.

- Department of Non Formal Education. (1996). Research Series in Non Formal External Education Relating to Participatory Action Research. Bangkok: Department of Non Formal Education.
- \_\_\_\_\_. (1998). Planning in Non-Formal Education in Proceeding for Human Resource Training Organized by the Project of System and Human Resource Development in Non- Formal Education Planning. Bangkok: Planning Division Department of Non Formal Education.
- \_\_\_\_\_. (1998). Manual of Portfolio Making. Bangkok: Communal Agricultural Cooperatives of Thailand.
- Department of Pollution Control. (1994). The Report on Pollution Situation in Thailand. Bangkok: Ministry of Science, Technology and Environment.
- \_\_\_\_\_. (1996). Toxic Situation in Thailand. Bangkok: Ministry of Science, Technology and Environment.
- Direk Rerkrai. (1981). The Principles of Agricultural Extension. Bangkok Office of Extension and Training, Kasetsart University.
- Division of the Eastern Army Troop. (1999). Survey Document Conducted in Tubtim Siam 05 Project Village Sakaeo Province: Ad Hoc Mission of Tubtim Siam 05 Project Village Development in Amphore Klong Had.
- Erwin , William. (1976). Participation Management : Concept Theory and Implementation. Atlanta Ga : Georgia State University.
- Greoge M. Foster. (1973). Traditional Societies and Technological Change. New York : Harper and Row Publishers, Inc., ,pp.146-147.

- Gronland, Norman E.(1981). Measurement and Evaluation in Teaching. New York :Macmillan Publishing Co., Inc.
- Havens, A. Eugene and Flinn, William. (1975). "Green Revolution Technology and Community Development : The Limits of Action Programs." Economic Development and Social Change. 23 : 469-481.
- Hoare, Tony Richard. (1995). Whose Knowledge? Using Participatory Action Research in Land Use Planning: The Mowachat Case Study . Dissertation Med. of Anthropology, Cultural . Canada: University of Calgary.
- Hovland, Carl I. And Janis.(1959) . I. Persinality and Persuadibility. New Haven : Yale University .
- Hussain and Other. (1992). ' Asia - Pacific Natural Agriculture Network ' for ILEIA : The Workshop Papers Background Reading . 9 - 15 March 1990 .Philippines : Silang , Cavite.
- Jaturong Boonvarattanasoonthorn.(1994). Comparative Study of Alternative agriculture and Monoculture: A Case Study of Farmers in Udompattana Village Amphore Nongbua Nakhonsawarn Province. M.A. Thesis in Economics, Graduate Studies Chulalongkorn University.
- Jirasithi Sithiroj and Yothin Sawasdee Bangkok. (n.d). Focus Group: Techniques for Qualitative Research. Bangkok. Qualitative Research Association of Thailand.
- Kamala Pasin. (1992) Sustainable Development. Bangkok: P.K Interprint

- Kamol Sudaprasert. (1997). Participatory Action Research Among Practitioners( The second edited). Bangkok. Bureau of Human Resources Development Project Co-ordination. Ministry of Education.
- Kanokwan Yuwong. (1998). The Study of Farmers' Adoption of Pesticide Free Vegetable Cropping. M.A .Thesis in Education, Department of Environmental Education, Graduate Studies, Mahidol University.
- Kibler, Robert J. and et. (1981).Al. Objectiver for Instruction and Evaluation. London :Allyn and Bacon, Inc.
- Krajang Panthumnavin, Sophon Saengwichiang, Chalermchat Wuttichai, Kwanchai Ruksapun and Somjed Sansarngcharoen. (1975). Agricultural Development Leading to the Implementation of Alternative Theories. Newsletter of Agricultural Sciences. 20(March-April 1975): 22-25
- Lionberger, H. F. (1960). Adoption of New Ideas and Practices. Iowa : The Iowa State University Press .
- Manee Chaitheeranuwatsiri et all. (1998). The Report on Participatory Action Research in the Student, Family and Community Development Through the Process of Environmental Education. Faculty of Social Science and Humanity, Mahidol University.
- Maslow , Abraham M.(1954). Motivation and Personality. New York. Harper and Brothers.

- Narumol Nantamatcha. (1989). Socio Economic and Communication Variables Influencing the Utilization of Herbicide. M.A. Thesis, Faculty of Journalist and Communication, Chulalongkorn University
- Niran Chongwuthiweth. (1984). The Strategies to Promote People Participation in Communal Development. Nakhonpathom: Study Center of Public Health Policy. Mahidol University.
- Office of Community Development in Amphore Klonghad. (1999). The Assessment form on Basic Household's Needs in the Village in 1999. Sakaeo: The Committees of Quality of Life Development in the Rural Area.
- Office of Forestry in Prachinburi Province. (n.d). Published Manuscripts. Prajinburi: Division of the Promotion of Forest Plantation.
- Panthip Rarmsoong. (1992). Participatory Research. Bangkok: The Association of Social Science Research.
- Pensri Rattana. (1993). People Participation in Environmental Development Program of Department of Land Development: A Case Study of Ubonratchatani Province. M.A. Thesis in Education, Department of Environmental Education, Graduate Studies, Mahidol University.
- Prapapen Suwan. (1983). Attitude to Measure Behavioral Changes. Bangkok: Thai Wattana Panich.
- Prasarn Tangsigbuth. (1984). Psychological Aspects Determining the Farmers Utilization Behavior of Insecticides for Vegetation Growing in Suburb. M.A. Thesis in Social Science, Department of Environment, Graduate Studies, Mahidol University.

- Prathamapidok. (1996). Sustainable Development. Bangkok: Sahathammic Inc.
- Prenporn Phewngam. (1989). Factors Associating the Adoption of Innovation Among People: A Case Study of the Project of People Participation in the Monitoring of Water Quality for Consumption in the Village. M.A. Thesis, Faculty of Social Science and Humanity, Thammasat University.
- Rodsana Tositrakul. (1994). The One Straw Revolution. (The seventh edited book). Bangkok: Komol Keemthong Foundation.
- Roger, EM. With F. Floyd Shoemaker. (1971). Communication of Innovation : A Cross Culture Approach. New York : The Free Press.
- R.R. Harwood.( 1991). ' A History of Sustainable Agriculture ' in C.A. Edwards (edited), Sustainable Agriculture System : Iowa.
- Sa-ard Yothaphol. (1991). Can Natural Agricultural Help Farmers?. Bangkok: Social Volunteer Foundation.
- Sajogyo and Collier, W. L. (1973)."Adoption of New Hight Yielding rice Varities by Java'sFarmers ." in R.T. Shand (Ed.), Technical Change in Asian Agriculture. Canberra, Australia : Australian National University Press.
- Sakaeo Provincial Office. (1994). Provincial Report: Division of Planing and Project. Sakaeo: Provincial Office.
- \_\_\_\_\_.(1996). Provincial Environmental Plan of Sakaeo Province. Sakaeo: Provincial Office.
- \_\_\_\_\_. (1998). Provincial Report in Version Submitted to Her Royal Highness Sirindhorn. Sakaeo: Division of Information and Assessment.

Sanith Samakarn. (1982). Cultural Changes and Social Development. Bangkok: Odeon Store.

Saving Bank. (1997). Bangkok: Headquarter of Saving Bank. Mimeographs.

Simaluk Diteesawaswej. (1991). Factors Associating with Using Behavior of Pesticide Among Agriculturists in Mahasarakham Province. M.A. Thesis in Social Science, Department of Environment, Graduate Studies, Mahidol Univesity.

Sirirat Bamroongkorn. (1989). Factors Associating with the Adoption of Innovation Among Farmers. A Case Study of Pattanee. M.A. Thesis, Faculty of Social Science and Humanity, Thammasat University.

Somsak Podduang. (1995). Changes on Knowledge, Attitude and Practices Relating to Natural Agriculture Among Trainees from Vocational Training and Development Center along Thai Border in Sakaeo Province. Bangkok: Human Resource Development Center Department of Non Formal Education.

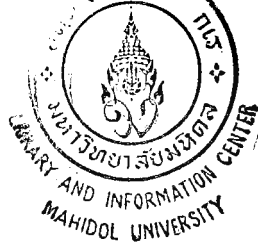
Somsak Sanyakamthorn. (1987). Evaluation of Self-Protection Village Project along Thai-Cambodia Border in Prajinburi Province. Ph.D. Thesis in Education, Srinakarinviroj Prasarnmit University.

Somsak Srisantisook. (1985). Social and Cultural Changes: The Approach to Study and Analyze Changes. Khonkaen: Faculty of Social Science and Humanity, Khonkaen University.

Stan Davis and Jim Botkin. (1994). The Monster Under the Bed. New York: Simon and Schuster Rockefeller Center.

Supaphan Na Bangchang., et al. (1988). The Development of Communal Organization in Chachoengsao Province. Bangkok: Chulalonglorn University Printing.

- Supoj Chaivimol. (1990). Factors Influencing the Adoption of Producing and Using of Compost Manure Among Farmers in Amphore Taphahin Phichit Province. M.A. Thesis in Science (Agriculture), Department of Agricultural Extension, Kasetsart University.
- Tasanee Nan-U-Don. (1996). 12 Toxic Chemicals to Life and Environment. Bangkok: Alternative Agriculture Network.
- Thailand Environmental Institute. (1995). The Report on Environmental Situation. Bangkok: Thailand Environmental Institute.
- Thai MOA Foundation. (1996). Toward the 21<sup>th</sup> Century: Natural Agriculture for the Enhancement of the Complete Agriculture and Healthy Nutrition. Bangkok: Thai MOA Foundation.
- Thai MOA International. (1997). MOA Nature Farming for Quality of life in Thailand. Bangkok Thai M O International.
- The Ad Hoc Border Area Development Unit in Amphore Tapraya.(1998). Implementation Plan in the Project of Self-Prptection Village Along Border of Thai-Cambodia Amphore Ta Praya Sakaeo Province in 1998. Sakaeo: Office of Thai-Cambodia Border Development in Sakaeo Province the Regional Army 1.
- The National Culture Board. (1997). 10 Years of Agro-Forestry. Bangkok: Religious Printing Department of Religious.
- The National Economic and Social Development Board. (1996). The Eighth National Economic and Social Development (1997-2001). Bangkok: Office of Prime Minister.



United Nations.(1980). Research Institute for social Development.

Uthumporn Thonguthai. (1987). The Information Analysis in the Qualitative Approach. Bangkok: Funny Publishing.

Veeraboon Visartsakul. (1995). Adoption Process of Alternative Agriculture Practices in Northeast Village: A Case Study of Nong Yai Viilage. M.A. Thesis, Department of Appropriate Technology for Resource Development, Graduate Studies, Mahidol University.

Vijid Awakul. (1984). Principles of Agricultural Extension. Bangkok: OS Printing House.

Vinai Veerawattananon. (1997). Environmental Crisis: Impasse of Development. (The second edited ). Bangkok: Songsiam.

Vitoon Lianjumloon. (1996). Alternative Agriculture. Bangkok: Pimdee.

\_\_\_\_\_. (1991). Integrated Agriculture: The Last Chance for Thai Agriculturist. Bangkok: Appropriate Technology Association.

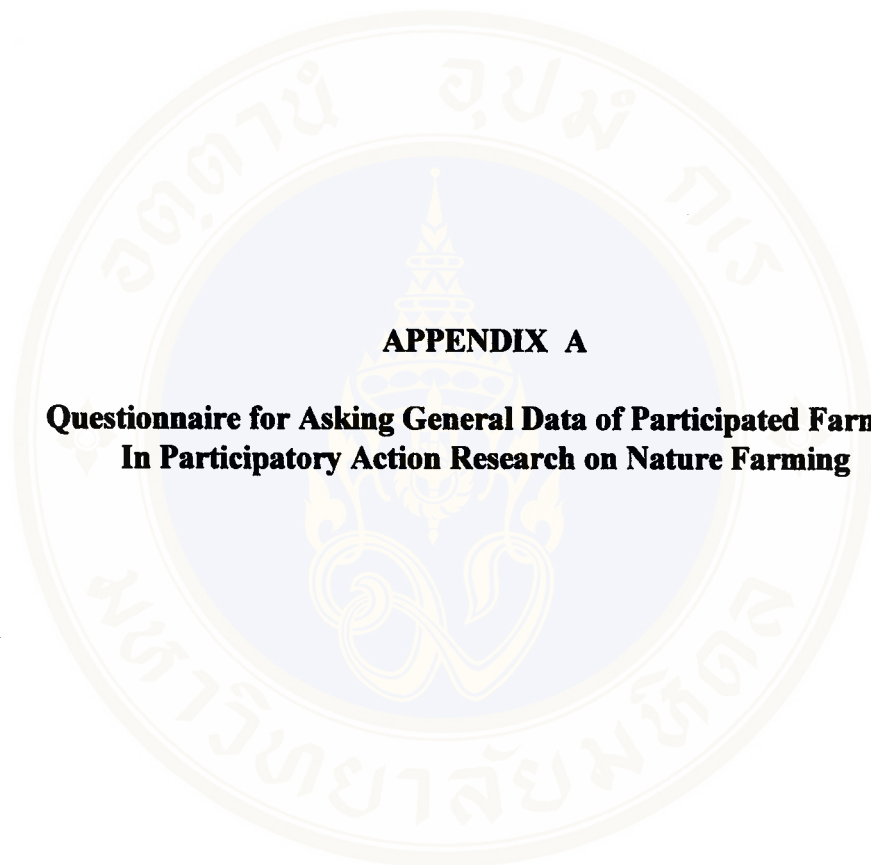
\_\_\_\_\_. (1992). Alternative agriculture: The Survival for Thai Agriculturist. Bangkok: Alternative Agriculture Network.

\_\_\_\_\_. (1991). The Report on the Evolution of Alternative Agriculture. Appropriate Technology Association. Bangkok: (n.d)

Vittaya Dhamrongkiatisak. (1986). Agricultural Communication. Chiangmai: Duangtawan Publishing.

Vittaya Vongkool. (1989). The Bibliography of Unimportant People:-Local Learned man. Bangkok: Village Publishing.

- Wallace, Marcia Lynne.(1995). PAR: A Role for Citizens in Community Development.Dissertation MA. of Sociology. Canada: Queen's University at Kingston.
- Warakorn Sukdhamaraksa. (1994). Socio Economic Factors Affecting the Acceptance if Neem Extracts Use as an Insect Control Tool for Farmers in Ratchaburi Province. M.A. Thesis in Science, Department of Appropriate Technology for Resource Development, Graduate Studies, Mahidol University.
- Waraporn Srisupan. (edt). (1991). Sustainable Development. Bangkok: Faculty of Social Science and Humanity, Mahidol University.
- Watcharaporn Takuldid. (1982). Factors Influencing Attitude on the Adoption of New Pattern of Rice Cropping Among Farmers in Amphore Promburi Singhaburi Province. M.A. Thesis. Faculty of Journalist and Communication, Chulalonglorn University.
- Wattana Muangngarm. (1998). Knowledge and Opinions of Secondary Education Agriculture Teacher in the Education Region 5 about Sustainable Development. M.A. Thesis in Education, Department of Environmental Education, Graduate Studies, Mahidol University.
- WHO .(1982). Review of Primary Health Care SHS/B2,3.
- William W. Reeder. (1974).Some Aspects of the Informal Social Participation of Form Families in New York State Canell University . unpublished . H.D. Dissertation.
- Wuttichai Chambnong. (1978). Learning on Basic and Applied Theories. Bangkok: Ruamsarn.



**APPENDIX A**

**Questionnaire for Asking General Data of Participated Farmers  
In Participatory Action Research on Nature Farming**

**Questionnaire for Asking Participated Farmers in Thai - Cambodia Border Area.**

---

Name.....

Address.....

**Section 1** General data of farmer participated in the project.

1. Status in family

1. Chief  2. Wife

3. Member of family

2. Sex  Male  Female

3. Age..... years.

4. Education background.

1. Uneducated

2. Primary school

3. Secondary school

4. Bachelor degree or up.

5. Status

1. Single

2. Married

3. Widow

4. Divorce

5. Separate

6. Others (please specify)

6. How many members in your family

Male..... Female.....

7. Your Hometown.....

8. How long have you lived in this village?

9. Reason for moving in

Friends or relatives persuaded me

Want new farm land

No land to work for a living

Jobless, Unemployment

Others... (please specify)

10. Total of labour members in your family who are farmers since the age of 15 up.

Male..... Female.....

**Section 2** Economic data.

2.1 Principal occupation/Income/Expense/Money Saving/Debts from last year.

1. Your principal occupation

Farmer

Agriculturist

Corn

Sugar Cane

Sorghum

Cotton

Soybean

Sunflower

Cassava

Others (Please Specify)

[ ] To do gardening

Rubber

Others (please Specify)

[ ] Merchant

[ ] To be Employed (please specify)

[ ] Others (please Specify)

2. Last year's income..... baht (Income from vegetable growing )

3. Total of last year expense.....

your principal expense in vegetable growing.....

4. Did you have saving money last year?

[ ] No.

[ ] Yes, .....

5. If have. How can you save your money?

[ ] Deposit to the bank

[ ] Keep it at the house

[ ] Keep it with parent or relatives

[ ] Buy gold, Gemstones.

[ ] Others (please specify.)

6. Do you have debt now?

[ ] Yes, I have debt..... baht.

[ ] No

7. If you have debt, What in the main reason to be debt?

- Borrow money for investing in agriculture
- Borrow money for daily expense
- Borrow money for child school fee
- Others (please specify.)

8. Can you pay your debt?

- No money to pay
- Can pay @ 40,000 bath per year.

2.2 Data on growing vegetable

1. How long have you been growing vegetable?.....

How much growing land do you have?.....

2. Detailed data of vegetable grown last year are as follow;

Kind of Veg.	Area Sign	Purpose	Growing Time:Year	Total Per Year (Official)
1.				
2.				
3.				
4.				
5.				
6.				

3. Growing period @.....

4.Appropriate month for growing.....

5.Period that vegetable are the highest price.....

## 6. Capital of growing vegetable

	Total of money	Total	Cross Total
1. Rental fee			
2. Plowing cost			
3. Seed cost			
4. Insecticide cost			
5. Weed			
6. Fertilizer cost			
7. Growing labour cost			
8. Harvest cost			
9. Growing meterial cost			
10. Transport cost			
11. Fuel oil cost			
12. Maintenance cost			

\* Capital of growing vegetable / year

7. Do you have any profit from growing?

No, profit, loss..... baht.

Yes, have profit..... baht.

8. Do you satisfy wilt vegetable price?

Not satisfy

Satisfy

9. How do you sell your vegetable?

- Middle man come to buy it in the village.
- Sell by myself in the local market
- Merchant in the village buy it
- Group buy it
- Cooperative buy it
- Other channel (Please specify)
- Do not sell.

**Section 3** Social data

1. Which member in the community are you in?

Group	Member	Not member
1. Agriculturist wife 2. Sweet black soy group 3. Mushroom planting group. 4. Kitchen garden Veg. group. 5. Rice bank 6. Chicken feeding 7. Cow feeding juvenile group. 8. Marketing demonstrated group. 9. Money saving group.		

2. Have you ever cooperated in developing community?

3. In your community, What is your problem and your need? (Please specify depending on how urgent it is)

1.....

2.....

3.....

**Section 4 Environmental data.**

1. How much Land Holding area do you have?

2. Total of vegetable growing land..... rai

3. Your vegetable growing area is..... km. far from your house.

4. Do you have water problem in growing vegetable?

[ ] Yes, I have problem

[ ] No, I don't have.

5. Which sources do you use water in planting vegetable?

[ ] Rain water

[ ] Underground water well

[ ] Shallow water well

[ ] River, Stream (please Specify)

[ ] Pond

[ ] Tide way

[ ] Reservoir

[ ] Others (please specify)

6. Which method did you use to improve soil for growing vegetable?

- Use fertilizer
- Use droppings and weed
- Both way
- Use nothing
- Others (please Specify)

7. Which methods did you manage with weed and pest insect?

- Nothing
- Spray chemicals.

8. Have you ever used chemicals to get rid of vegetable enemy?

- Never
- yes

If so..... year, specify chemicals name that you normally

use.....Quantity..... Litre/Kg/ yrs.

Average cost..... Bath/year.

9. In your family, Did you ever have a relative being sick from receiving toxic chemical?

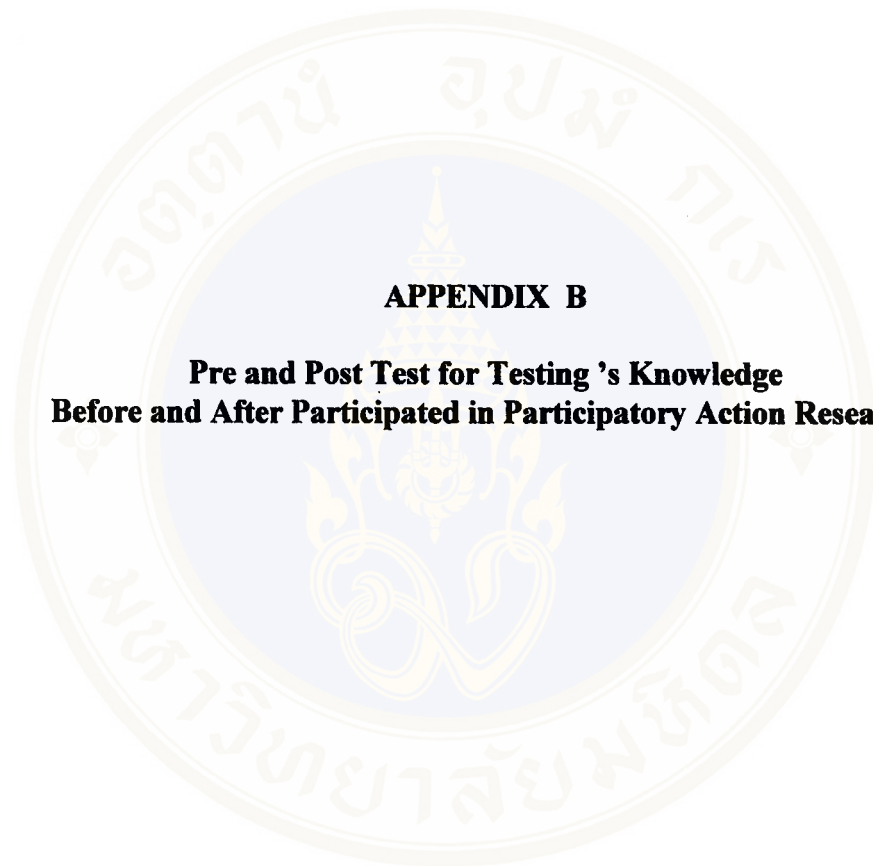
- Never had that kind of sickness.
- Yes

10 Is there any people in your community received toxic from agriculture?

- Yes
- Never

11. The use of material left from nature in your community are as follow;

Name of nature material	Never	Ever	How can you use?
1. Straw			
2. Cob			
3. Bagasse			
4. Droppings			
5. Peanut skin			
6. Others (please Specify)			



**APPENDIX B**

**Pre and Post Test for Testing 's Knowledge  
Before and After Participated in Participatory Action Research**

## Questionnaire for Testing Farmer's Knowledge on Nature Farming

---

### Agreement in answer questionnaire

1. Nature farming : means nature farming technique MOA.
2. Researcher will read the questions and choices of answer to farmer and will mark X in ( ) the answer that farmer choose only 1 answer.

### Nature Farming Knowledge.

1. Which is prohibited to be used in nature farming?
  - A. Chicken manure
  - B. Soybean
  - C. Human excrement.
  - D. Straw
2. Which is the special character of nature farming vegetable?
  - A. Price does not change
  - B. Sweet flavor, longer kept.
  - C. More strong smell but more value
  - D. Less light weight than vegetable in the market.
3. Which in the main purpose of...
  - A. To protect weed from growing
  - B. To protect moisture evaporate from soil layer
  - C. To protect soil from contact sunshine directly.
  - D. To maintain soil layer temperature.

4. How many times do you fertilize nature farming vegetable?

- A. Once
- B. Twice
- C. Three times
- D. More than 3 times

5. When will we begin to fertilize in nature farming?

- A. When begin plowing to prepare soil
- B. When begin sowing vegetable seed
- C. When plant has just emerged
- D. When it is close to harvest

6. What natural material can be Used in water fertilizer?

- A. All kind of weeds
- B. All kind of droppings
- C. None of them
- D. Both of them

**Nature farming understanding**

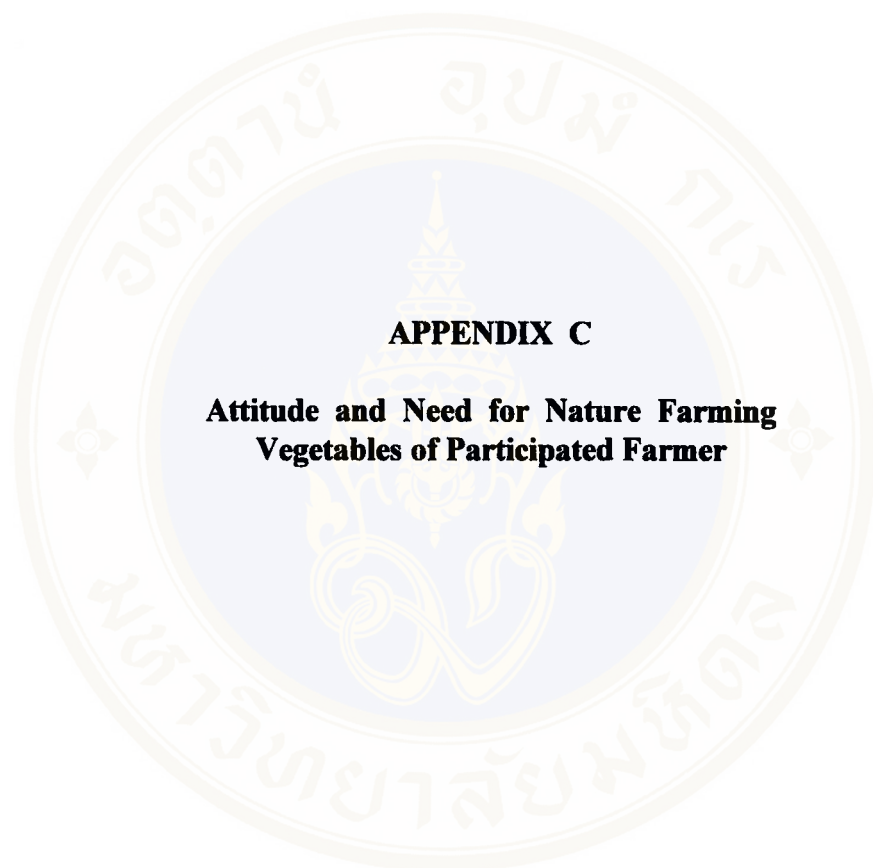
7. Which answer is not correct in terms of nature farming?

- A. Nature farming has to be invested more at the first time
- B. Nature farming can be done in terms of business
- C. Nature farming concentrate on bringing highest potentiality of soil to use
- D. Nature farming can be done in some areas

8. What plant can nature farming grow?

- A. Rice

- B. Farm plant
  - C. Garden plant
  - D. Every kind of plant
9. If you want to grow vegetable by nature farming method, How many times in one year can you re-use the same allotment?
- A. Once
  - B. Twice
  - C. Three times
  - D. Four times
10. When can you improve agricultural allotment from old method to nature farming method?
- A. Suddenly
  - B. Must wait until chemicals left in soil vanish
  - C. Must wait at least 6 months
  - D. Must wait at least 1-2 years
11. From your understanding, What does vegetable from nature farming mean?
- A. More nutrition than vegetable growing with chemical
  - B. Less capital in production at the first period
  - C. Always has insect destroy, so, the output is sold in low price
  - D. High nutrition, safe to consume



**APPENDIX C**

**Attitude and Need for Nature Farming  
Vegetables of Participated Farmer**

**Attitude and Need for Nature Farming Vegetable**

---

1. Is it safe to consume vegetable sold in the market ?

Safe                       Not Safe

2. When you bought vegetable in the market, Have you ever asked the seller that it was toxic free?

Ever                       Never

3. Are you willing to pay more to buy natural vegetables?

willing                       Not willing

4. Is it necessary to use insecticide in Allotment?

Necessary                       Not necessary

5. Can decompose organic waste replace fertilizer and have same quality?

yes, can                       No

6. Is chemical fertilizer more convenience than natural fertilizer and give more output?

yes                       No

7. Are the expense of making decompose higher and more complicate?

yes                       No

8. Can eating nature farming vegetable make your member of family more healthy

More healthy                       Not healthy

9. Are you willing to participate in government program promoting nature farming?

I'm willing                       I'm not willing

10. Do you want to have knowledge and technique relating to growing vegetable with nature farming?

want                       Not want

11. Can nature farming give you more agricultural output?

Increase                       Not Increase

12. Do you want to use nature farming in your farm land?

want                       Not want

13. Do you think that vegetable growing by nature farming may not as beautiful as growing by chemical fertilizer?

yes                       No

14. Do you think that selling nature farming product still have low price sell problem.

yes                       No

15. Are you worry that, If, you grow vegetable by nature farming, your product will not beautiful and sell at cheaper price?

Yes, I'm worry                       No, I'm not.

16. Is it necessary to promote the nature farming method in your village?

Necessary                       Not necessary

17. Do you think that nature farming project is likely change your way of cultivation in your village?

Change                       Not change

18. Will you continue nature farming method after the project came to an end?

Continue                       Not continue

## BIOGRAPHY

<b>NAME</b>	Mrs. Marisa Koseyayothin
<b>DATE OF BIRTH</b>	29 August 1957
<b>PLACE OF BIRTH</b>	Bangkok, Thailand
<b>INSTITUTIONS ATTENDED</b>	Chulalongkorn University , 1975-1979 Bachelor of Education (Art Ed.) Mahidol University, 1987-1989: Master of Education (Environmental Education) Mahidol University, 1996-2000: Doctor of Education (Environmental Education)
<b>RESEARCH GRANT</b>	Research for Thesis Grant, Faculty of Graduate Studies, Mahidol University.
<b>POSITION &amp; OFFICE</b>	1984-Present, Department of Non-formal Education, Ministry of Education Position : Lecturer