CONTENTS

	Page
Acknowledgement	c
Abstract to Thai	d
Abstract to English	f
List of Tables	r
List of Figures	1
Statements of Originality in Thai	u
Statements of Originality in English	v
Chapter 1 Introduction	1
Background and Problem	1
The Need for Greater Agricultural Diversification in	1
Northeast Thailand	
Agricultural Extension in Thailand; Characteristics	3
And Change	
The Evolution of Concepts and Methods of Extension	5
Concepts of extension	5
The classic extension process: learning, adoption, and diffusion	6
The shift in learning and diffusion theory	8
Evolution of South and Southeast Asian extension systems	8
Changes in extension organization	9
Lessons from the Training and Visit System	10
Paradigms of communication in different extension systems	11
Farmer-to-Farmer Approaches	12
Reasons for emergence	12
Learning process in the Farmer Field School (FFS) approach	12
Other examples of farmer-to-farmer approach	14
A theoretical basis for farmer-to-farmer extension and	15
learning	

		Page
	Methods of farmer-to-farmer learning	16
	An unresolved methodological need-scaling out and up	18
	beyond one village	
	Objectives	20
	Overall hypothesis	20
	Research design	20
	Area	21
	Contents	21
Chapter 2	Literature reviewed	22
	Introduction	22
	General Information of The Country	22
	Agricultural Development in Thailand	23
	Information of Northeast, Thailand	26
	Topography	26
	Geology and soils	27
	Northeast economy and its context	27
	Growth indicators	27
	Agricultural sector	27
	Number and Area of Holdings	28
-	Conditions of Agricultural Economic and Development	29
Α.	in Northeast	
A	Labor productivity	29
	Land quality	31
	Poverty in rural area and population	32
	Labor productivity	32
	Land quality	
	Farming enterprise	35
	Public spending	36

	Page
Government's policy for development programs	36
Irrigation system and water resources	39
Weather risk and condition	41
Agricultural Value Added and Household production	43
Regional Growth in Northeast	43
Regional population and GDP shares	44
Structure of Economic Change	45
Research and extension	46
Lesson learnt with agricultural development	47
Three Main Crops in Northeast: Rice, Cassava and Sugarcane	49
Rice	49
Cassava	51
Sugar cane	52
Conditions of Khon Kaen province	54
Physical characteristics	54
Administration, Population and Labor Force	55
Agricultural Production	55
Marketing of Farm Products	56
Gross Provincial Products (GPP)	57
Learning theory	58
Grounded theory	62
Agricultural Systems in Thailand	63
Integrated farming system	64
Organic farming	64
Natural farming	65
Agro-forestry	65
New Theory farming	66

		Page
	Philosophy of Sufficiency Economy	67
	Thai Jasmine rice (Kao Hom Mali)	73
	Chapter Conclusion	77
Chapter 3	Research Method	78
	Research Area	78
	Introduction Research area Methods	78
	Research area	78
	Methods	79
	Activity 1: The method Assessment of the target villages	80
	before FFLP and assessment of impacts of	
	FFLP and innovation	
	Activity 2: The characteristics and mechanize of FFLP	90
	technologies on cost and assessment of	
	effects of FFLP technologies on income of	
	land	
	Activity 3: Dissemination of FFLP to local administration	94
	organization and scaling out to other areas	
	and network building	
	Research framework	95
-	Conclusion by Chiang Mai University	97
Chapter 4	Research results	98
A	Activity 1: Assessment of the target villages before FFLP	98
	and assessment of impacts of FFLP	
	Assessment of the homogeneity of the target village and	98
	the relationship of farm ponds with diversification and	
	farm income before FFLP	

1	Page
Assessment of the impact of a farmer-to-farmer learning	113
and innovation scaling out process on technology	
adaptation, farm income and diversification in	
Northeast Thailand	
Activity 2:	131
The characteristic and Mechanize of FFLP	131
Technologies on Cost and Income of research	
Assessment of the effect of four technologies	146
introduced by FFLP on the income productivity of land	
Activity 3:	160
Application of the New Approach to a Wider Area:	160
dissemination to Tambol Administration Organization (TAO)	
Scaling out FFLP on efficient water use and for	175
chemically free vegetable production and network	
building	
Chapter 5 Conclusions, Discussions and Recommendations	193
References	202
Curriculum Vitae	210
ลิขสิทธิ์มหาวิทยาลัยเชียงใหม	
Copyright [©] by Chiang Mai University	
All rights reserved	

LIST OF TABLES

		Page
Table 1	Comparative performance of agricultural and non-agricultural	24
	sectors, 1972-1996	
Table 2	Production of Major Agricultural Commodities	25
Table 3	Rice (Major and second): Area, production, yield and farm	50
	price, 2000-2009	
Table 4	Cassava: Area, production, yield and farm price, 2001-2010	52
Table 5	Sugar cane: Area, production, yield and farm price 2001-2010	53
Table 6	Planted areas, production, yield/rai of 4 crops of whole	54
	country during 2001-2005	
Table 7	Crops: Annual planting areas in Khon Kaen 1985-1995	56
Table 8	Gross Provincial Product of Khon Kaen at current	57
	market price 2002-2009	
Table 9	Overview of Learning Theories	60
Table 10	Learning process and assessment activities in 2005	91
Table 11	Learning process and assessment activities in 2006	91
Table 12	Learning process and assessment activities in 2007	91
Table 13	Learning process and assessment activities in 2008	92
Table 14	Household size, land area per farm, pond number and	101
	volume, and farm and total income in intervention and	
	control tambons in four districts ¹⁾	
Table 15	Numbers of farms with and without ponds in intervention	102
,	and control tambons in four amphoes in Khon Kaen	
	province, 2005 ¹⁾	
Table 16	Agricultural revenue levels of farmers in intervention	103
	and control tambons	
Table 17	Diversification levels of farmers in intervention and	104
	control tambons	

LIST OF TABLES (CONTINUED)

		Page
Table 18	Household size, land area per farm, pond number, pond	105
	volume and Agricultural revenue at four levels of	
	diversification with three types of activities ¹⁾	
Table 19	Levels and types of diversification on farms with and	106
	without ponds	
Table 20	Levels of diversification of farms with and without ponds in	107
	intervention and control tambons in four amphoes	
Table 21	Relationship between pond volume and diversification level	109
	and type	
Table 22	Relationship between pond volume and farm income	110
	categories in intervention and control tambons	
Table 23	Reasons of farmers adapting technologies	118
Table 24	Number of adapting farmers in FFLP	118
Table 25	Income of farmers adapting and not adapting custard apple	121
	management and liquid fertilizer technology	
Table 26	Income of farmers adapting and not adapting herbal	122
	extraction and cassava- based animal feed technology	
Table 27	Patterns of diversification changing from base agriculture	125
	activity to other levels of number of diversification activities	
Table 28	Patterns of diversification changing from base agriculture	126
	activity with fruit to other levels of number of diversification	
,	activities	
Table 29	Patterns of diversification changed from base agriculture	127
	activity with livestock to other levels of number of	
	diversification activities	
Table 30	Differences in levels of number of the diversification change	127
	in Table 26	

LIST OF TABLES (CONTINUED)

		Page
Table 31	Differences in levels of number of the diversification change in Table 27	128
Table 32	Differences in levels of number of the diversification change in Table 28	128
Table 33	Differences in levels of diversification between farmers	129
	adapting and not adapting custard apple technology in 2007	
Table 34	Differences in levels of diversification between farmers	130
	adapting and not adapting liquid fertilizer technology in 2007	
Table 35	Differences in levels of diversification between farmers	130
	adapting and not adapting herbal extraction in 2007	
Table 36	Differences in levels of diversification between farmers	130
	adapting and not adapting cassava technology in 2007	
Table 37	Mechanism of technology adaptation and effect on costs	141
	and income of custard apple management technology	
	of 64 adapting farmers	
Table 38	Mechanism of technology adaptation and effect on costs	141
	and income of liquid organic fertilizer of 58 adapting farmers	
Table 39	Mechanism of technology adaptation and effect on costs and	142
	income of herbal repellent extraction of 38 adapting farmers	
Table 40	Mechanism of technology adaptation and effect on costs	142
	and income of cassava-based animal feed of 18 adapting	
	farmers	
Table 41	Effect of custard apple technology on production and farm	143
	revenue	
Table 42	Effect of organic fertilizer technology on rice yield and farm	143
	revenue	

LIST OF TABLES (CONTINUED)

		Page
Table 43	Effect of herbal extraction technology on rice yield and farm	144
	revenue	
Table 44	Effect of organic fertilizer technology on vegetable production	144
	and farm revenue	
Table 45	Effect of herbal extraction technology on vegetable production	144
	and farm revenue	
Table 46	Effect of cassava feed technology on production and	145
	farm revenue	
Table 47	FFLP Flow process for scaling out our introduced	151
	technologies and number of adapting farmers	
Table 48	Effect of farm size and diversification level on farm income	154
	between adapting and non adapting farmers in 2008	
Table 49	Farm revenue between 2005 and 2008 of 16 FFLP farmers	155
	who participated Nong Saeng 2006 workshop (Baht)	
Table 50	Contributions of FFLP activities, other diversification, base	157
	agricultural activities, and non-agricultural activities to	
	household income of all 85 FFLP farmers in 2008 (Baht)	
Table 51	Agricultural revenue per hectare of FFLP farmers (baht /ha)	158
Table 52	Time period and FFLP activities	164
Table 53	Lists of TAOs which plan to adapt FFLP technologies	174
Table 54	Comparison of the irrigation technology between using water	179
	pump and sprinkler irrigation system	
Table 55	Formula and types of herbal plants to produce the herbal	182
	repulsive extraction	
Table 56	Three formula of liquid organic fertilizer and local raw materials	183
Table 57	villages, number of farmers and income from vegetable cultivation	188

LISTS OF FIGURE

		Page
Figure 1	Learning process of farmer field research	13
Figure 2	Agricultural GDP, 1970 to 2004 on Regional Contribution	29
	(Percent of Total)	
Figure 3	Agricultural Value Added by Agricultural Worker, 1991	29
	to 2004	
Figure 4	Farming Households as a Percent of All Households in 2002	30
Figure 5	Farm Size (Rai)	30
Figure 6	Farm and Non-Farm Workers per Household	30
Figure 7	Gross Revenue and Margin per Hectare and per Household Worker	30
Figure 8	Percentage of Household Using Farming Input	31
Figure 9	Baht spent on Farming Input among Users	31
Figure 10	Poverty Headcount by User Status, Percent	32
Figure 11	Poverty Headcount (Percent) in 2002	32
Figure 12	Number of Poor in 2002	33
Figure 13	Poverty Headcount in each region 1988 to 2002	34
Figure 14	Number of Poor during 1988 to 2002	34
Figure 15	Farming by type (%)	35
Figure 16	Poverty Headcount and enterprise Type (%)	35
Figure 17	Number of Poor and Enterprise Type (head)	35
Figure 18	Public Spending on Agriculture, FY 2002	36
Figure 19	Farm Debt in 2002	37
Figure 20	Beneficiaries of Debt Moratorium Program among Farmers	37
	with Debt in 2002	
Figure 21	Recipients of Village Fund Loans in 2002	38
Figure 22	Irrigated Area (1,000 rai), 1977 to 2000	40
Figure 23	Irrigation Area by Scale of Irrigation Scheme, 2001	40
Figure 24	Irrigated Areas as green-shaded in 2002	40

LISTS OF FIGURE (CONTINUED)

		Page
Figure 25	Real Agricultural Growth Rates, 1971 to 2004	41
Figure 26	Drought Statistics among Rice Farmers for 1991 to 2001	42
	in the Northeast	
Figure 27	Composition of the Value Added of the Agricultural Sector,	43
	Northeast (1994 to 2001)	
Figure 28	Composition of the Value Added of the Agricultural Sector,	43
	Thailand (1996 to 2003)	
Figure 29	Regional Per Capita GDP, 1970 to 2004, 1988 Prices	44
Figure 30	Regional GDP Per Capita Relative to Northeast, 1970 to 2004,	44
	Northeast=100	
Figure 31	Regional Population Shares, 1970 to 2004	45
Figure 32	Regional GDP Shares, 1970 to 2004, 1988 Prices	45
Figure 33	Northeast Regional GDP Composition, 1970 to 2004	46
Figure 34	Public Expenditure on Agricultural Research and Extension,	46
	FY 2003 (%)	
Figure 35	The learning cycle	61
Figure 36	The philosophy of sufficiency economy	69
Figure 37	Research area located in the southern part of Khon Kaen	79
ฤ	province	
Figure 38	Scaling out and scaling up to the regional level of southern	83
Δ	Khon Kaen Province	
Figure 39	Change in number of diversification level with increasing	108
	numbers of ponds	
Figure 40	Change in total revenue with increasing levels of	111
	diversification	
Figure 41	Change in agricultural revenue with increasing levels of	111
	diversification	

LISTS OF FIGURE (CONTINUED)

		Page
Figure 42	Percentages of farmers gaining technology information	116
	from different Sources	
Figure 43	The number of adapted technology farmers in 2006-2007	116
Figure 44	Reasons of farmers for adapting four introduced technologies	117
Figure 45	Farm incomes from activities using four technologies	119
	of adapting and non- adapting farmers	
Figure 46	Incomes between adapting and non-adapting technologies	120
	farmers in 2007	
Figure 47	Farm incomes from four agricultural activities of farmers	123
	adapting introduced technologies in 2007	
Figure 48	Comparison of the number of farmers at four levels of	124
	numbers of diversification activities between 2005-2007	
Figure 49	Adapting and non-adapting farmers with diversification	129
	in 2007	
Figure 50	Regression between number of diversification activities	145
	and farm income	
Figure 51	Regression between number of introduced technology	152
0.	and farm income	
Figure 52	FFLP farm revenue in 2006 to 2008	153
Figure 53	Non-FFLP farm revenue in 2006 to 2008	156
Figure 54	The Linkages of Institution, Role and Information Flow	169
Figure 55-56	Interview TAO's president and TAO's staff	170
Figure 57	Knowing FFLP technologies of TAOs' officers	171
Figure 58-59	Custard apple cultivated near farm pond	171
Figure 60	Sources of FFLP technologies information	172
Figure 61	Benefits to adapting farmers	173

LISTS OF FIGURE (CONTINUED)

		Page
Figure 62-63	Soil improvement by Organic Fertilizer before	173
	growing chili	
Figure 64	Irrigation system on blue print	179
Figure 65	Irrigation system at demonstration plot	179
Figure 66	Sprinkle system	180
Figure 67	Herbal repulsive extraction equipment	181
Figure 68	Herbal plants were used for extraction	181
Figure 69	FFLP on demonstration plot	185
Figure 70	presents the four parties get involved in net building	187
Figure 71-74	show project sites in four villages in two districts	189
Figure 75	Learning by Framework for scaling out	190

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright[©] by Chiang Mai University
All rights reserved

STATE MENTS OF ORIGINALITY

- 1) This thesis had developed the model of Farmer-to-Farmer Learning Process (FFLP) of technology increasing diversification agricultural. Furthermore, the thesis is to develop the agricultural extension by FFLP and to assess the FFLP model had introduced technology including to study FFLP model result on network building.
- 2) The researcher would like to certify that the contents acquired through the study of researcher with the advisors. The research result derived through the reliable resources. This thesis any part of it had not been created to fulfill the requirements for a degree in any institution or for other purpose.

กมยนต



ข้อความแห่งการริเริ่ม

- 1. วิทยานิพนธ์นี้ได้พัฒนารูปแบบกระบวนการแลกเปลี่ยนเรียนรู้ของเกษตรกรด้านเทคโนโลยี การเพิ่มความหลากลายทางชีวภาพทางการเกษตร นอกจากนี้วิทยานิพนธ์ยังพัฒนาวิธีการ ส่งเสริมทางการเกษตรด้วยกระบวนการแลกเปลี่ยนเรียนรู้ของเกษตรกรรวมทั้งการ ประเมินผลการใช้เทคโนโลยีที่แนะนำและการสร้างเครือข่าย
- 2. ผู้วิจัยขอรับรองว่าเนื้อหาวิทยานิพนธ์นี้เกิดจากการศึกษาค้นคว้าของผู้วิจัยโดยได้รับ คำแนะนำจากอาจารย์ที่ปรึกษาผลจากการศึกษาค้นคว้าได้มาจากแหล่งข้อมูลที่มีความ น่าเชื่อถือส่วนหนึ่งส่วนใดของวิทยานิพนธ์เล่มไม่ได้ถูกเสนอขอรับปริญญาใน สถาบันการศึกษาอื่น หรือวัตถุประสงค์อื่น

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่ Copyright[©] by Chiang Mai University All rights reserved