Chapter 5
Conclusions, Discussions and Recommendations

The chapter presents the conclusions and recommendations from this research.

5.1 Review of problem and need for FFLP

5.1.1 The need for diversification in NE Thailand

The Northeast Thailand, The primary occupation of the population remains rice-growing. The total land area of this region is 17 million hectares. Half of the land is devoted to agricultural production such as rice, sugarcane, vegetable, fruit tree and other field crop. The fundamental problems for small scale rice-growing farms are droughts and increasing costs of inputs. This causes farmers have reduced incomes from rice. The agriculture in Northeast region has normally faced many difficulties, such as sandy soil, no facilities for irrigation. These lead the agricultural productivities have been low yield. For instance, the rice productivity (2001/02) in the northeast, was 306 kg/rai white farmers gained 513 kg/rai in the central (Ando, 2004). Not only rice production but also cassava and sugarcane are the main cash income sources for the northeast farmers. Thus, the diversification activities, namely fruit, animal, fish, vegetable cultivation including making organic matter, should be promote for farmer take low risk from farm productions and generate more activities resulting to earn high income. The good example has been implemented is the integrated farming is one of the alternatives and the government has begun to operate it since 1990's. Furthermore, the King's New Theory project has been promoted to farmers to solve the problem on household food consumption and economic up to access to the market, then finally forming the group to operate the local enterprise.

5.1.2 Changes in Thai extension after T and V, resulting in the need for new methods for TAO extensions

Since the Green Revolution began in Thailand in 1960, the agricultural sector of Thailand has developed in response to market forces. Various problems have derived from such development such as forestland encroachment, water shortages, water

pollution, drought, flooding, soil erosion, soil degradation, and natural disasters. Thus, the Thai government has placed a high priority in addressing these policies to solve the problems. The process of decentralization and community participation in agricultural development and natural resource management and planning are implemented.

The experience of Thailand extension, both traditional-based and information technology-based are practically applied, in which effectiveness factor is farmer participation. Since 1999, the Agricultural Technology Transfer and Service Center (ATSC) has been established in Thailand and placed at the sub-district level under Department Of Agricultural Extension (DOAE) implementation. ATSC provides a mechanism for the participation of local government, farmer groups, communities, organizations, NGOs and private sectors involved in development process. However, there has been a crisis in agricultural extension in various components, namely, 1) a fiscal crisis-reducing government funding, 2) an effectiveness- extension practices are not working properly, 3) a traditional extension model still use - top-end to farmers, and 4) ATSC located in sub-district level-it is quite huge area difficulty for farmers to visit and learn, especially transportation and time. Thus, another agricultural extension model which is suitable for farmers in each village must be recommended. The farmer-led extension or farmer participatory in extension, for instance, FFLP is a new agricultural extension for the local government as TAO.

5.1.3 The key characteristics of your FFLP, indicating what is original in comparison with previous participatory and farmer learning approaches

The farmers are the primary extension agents. The FFLP is a extension model which support and stimulate farmers act as extension worker. FFLP aims at providing a tool to small scale farmers that allows them to gain insight in the performance of their management of crop and produce and to learn from comparing their performance with colleague farmers.

Achieving learning skills in farm, a model of learning process directed the research, this identifies two components to learn; 1) grasping information through conceptualization of experience and 2) transformation of information into knowledge through reflection of experimentation. The study suggests that learning research methods assist extension agents plan and negotiate the specific behavior changes.

Farmer-to-farmer learning process and innovation (FFLP) system of extension are base, as following: 1) motivates farmers to experiment with new technologies on a small scale; 2) adapt technologies to do trial on farms, 3) uses rapid, recognizable success in the experiment to motivate others to innovation; 4) uses technologies that rely on unexpensive, locally available resources; 5) begins with a limited number of technologies ; 6) collect data by farmers and analyse in simple way, and 7) trains villagers as extensionists and support them in teaching other farmers, 8) participate workshop to share and learn with other farmers.

5.2 Assessment of overall hypothesis and objectives

The overall hypothesis presented in result is that the use of the FFLP approach for scaling out participatory technology development will result in rapid adaptation of technology by a majority of farmers and increase diversification and the income productivity of land in the target area.

To test this hypothesis, we established the following objectives:

1) to characterize the mechanism of FFLP;

2) to assess the homogeneity of villages;

3) to identify factors affecting agricultural diversification in the target area prior to the initiation of FFLP;

4) to assess the effectiveness of FFLP as a source of information;

5) to assess the effects of four technologies introduced by FFLP on the diversification of agricultural activities in the target area.

6) to assess the effects of four technologies introduced by FFLP on the income productivity of land. in the target area.

The principal research results presented in this paper provide good support to the overall hypothesis, and indicate that the above objectives were achieved. The following summarizes these results.

Characterization of the scaling out target area and factors affecting diversification prior to FFLP. Prior to the initiation of FFLP, 2,308 farm households in eight *tambons* (sub-districts) in the four target *amphoes* (districts) were classified in a rapid census based on number of farm ponds and combinations of three types of income generating agricultural diversification activities using pond water: 1) fruit, 2) livestock,

and 3) vegetables. *Amphoes*, *tambons* and villages with similar topography, soil and cropping system had similar numbers of ponds, household size, level of diversity and income levels. Farms with higher numbers of ponds generated more diversification activities. Total and agricultural revenue increased as diversification level increased. Agricultural revenue increased more rapidly as diversification level rose to 2 and 3, while only one diversification activity had less effect.

These results indicate that the selection process resulted in a target area for scaling out with good homogeneity, and that farm ponds contribute positively to both agricultural diversification and farm income in the target area.

Initiation and characterization of the FFLP approach. A farmer-to-farmer learning and innovation process (FFLP) for technology development was developed in 2006. This process begun by building a network among the four *tambons* that were the targets of this scaling out research, and a *tambon* where three farmer experimental groups (livestock, water-saving vegetable production, and integrated farming) had been organized in 2003 and carried out technology development for three years. From this network, 85 farmers in the four scaling out *tambons* established goals for their farming, gathered information through additional farmer-to-farmer visits, and selected four technologies (custard apple pruning and water management, herbal repellent, liquid organic fertilizer, and cassava-based animal feed) to test and adapt to meet their goals. All of these technologies were diversification technologies. The FFLP approach created a social learning forum of seven villages in the target area.

Assessment of FFLP as an information source and its effects on diversification and the income productivity of land. Farmers' information sources were assessed; farmers' reasons for use of FFLP technologies investigated; and changes in farm income and diversification of 100 farmers (25 per village) were assessed in 2005, before FFLP was begun, and in 2006 and 2007, after one and two years of FFLP implementation. FFLP was the most important source of information for farmers, enabling 40 per cent of the farmers to obtain information from FFLP for herbal repellent and liquid organic fertilizer. Eighty-three per cent of farmers adapted at least one of the four technologies during the first two years of FFLP. Farmers adapting cassava-based animal feed increased 39 per cent, those adapting herbal extraction increased 111 per cent, those adapting liquid organic fertilizer increased 116 per cent, and those adapting

custard apple management increased 156 per cent. The principal reasons for adapting these technologies were reduced cost, increased farm yield, chemical free products and reduced pests. Farmers with three agricultural diversification activities increased by 850 per cent from 2005 to 2007. Adapting farmers had 99 per cent (2006) and 141 per cent (2007) higher farm income than non-adapting farmers.

These results indicate that can be seen that FFLP was an effective source of information, farmers' adaptation of new technologies increased rapidly through the use of FFLP, and diversification and farm income increased

Effect of each technology on the income productivity of land. Assessment was made of the adaptation of four introduced technologies and of the effects of these technologies on farm income and diversification through annual interviews of 100 farmers from 2006 to 2008. After three years of FFLP, 64 per cent of the farmers adapted custard apple management, 58 per cent adapted liquid organic fertilizer, 38 per cent adapted herbal repellent extraction, and 18 per cent adapted cassava–based animal feed. Farmers who adapted more technologies and generated more diversification gained higher incomes. Technologies introduced and adapted through FFLP contributed 24 % of farm income and 21 % of total income of the 100 farmers.

This shows that the farmer-to-farmer learning and innovation (FFLP) process is an effective method of technology change for increasing income in agricultural production.

Dissemination a model of FFLP to local administration organizations for improving agricultural extension service. The dissemination to local administration organization as Tambol administration organizations (TAO), was made of TAO's officers both management and operating level. The majority of TAO officers approximately 76 % had known about four FFLP technologies : 1) Liquid organic fertilizer 2) Herbal Bio Repellent Extraction use for insect expelling, 3) Custard apple cultivation and pruning and 4) Cassava production technology for animal feed. Network building was also developed by four parties participation, there were 1) farmer groups who adapted technologies and implemented on farms, 2) funding sectors in which support farms to get budget to invest on farms such as village funs, Bank for Agriculture and Agricultural cooperative (BAAC), NGOs and private sectors, 3) educational institutions, for instances, Universities, NGOs, Department of Agriculture

and Department of Agricultural Extension, and 4) marketing organizations such as local markets, private companies, agro processing factories.

Overall conclusion. The above research results support the hypothesis that the farmer-to-farmer learning and innovation (FFLP) process is an effective method of technology change for diversification adaptation and increasing income in agricultural production. Furthermore, five steps of FFLP was initiated: 1) initiative technology and activities on farms, 2) farm information change and plan to increase yield, reduced cost and gain more income, 3) technology adaptation after considering in which technologies suitable for farms, 4) assessment the results of adaptation and 5) sharing results to other farmers for scaling up and farm improvement. Initially, farmer also operated network building via four parties: farmer groups, marketing agencies, academic institutions and finding sectors

5.3 Limitations and implications of the results

1) FFLP did not provide agricultural inputs or funds for trial expenses to farmers. This was an important difference from many government projects. Farmers gained only knowledge and skills from field visits and information exchange on agricultural technologies through FFLP. For this reason, some farmers in the villages waited to see what the trial results of FFLP farmers would be. Only when they appreciated the results, would they begin to adapt themselves. This led FFLP technologies to spread somewhat slowly in the villages. On the other hand, this was a more socially and economically sustainable form of induced diffusion.

2) Political events at both the local and national level affected field research, especially in relation to the timing of organizing meetings in the villages and gathering data and information from farmers. Group meetings and interviews are not allowed during periods preceding local or general elections.

5.4 Recommendations for further research

Comparison between the costs of FFLP and traditional extension methods should be investigated. This should include comparisons between *tambons* and villages in the target area with similar characteristics, as were the control and intervention villages. This type of comparison was originally planned in this study, but could not be

implemented in due to time and budgetary constraints. Similar comparisons documented the effectiveness of the CIAL approach (Ashby et al., 2002). The results of such comparisons would be valuable for policy makers, local government, NGOs and private companies involved in extension in making decisions about the potential use of FFLP at various levels (local, provincial, and national). The information might also be useful for other countries considering use of similar farmer-to-farmer learning methods for scaling out.

1) The biophysical mechanisms of effectiveness of FFLP technologies should be studied and elucidated in more detail. For herbal repellent extraction, research is also needed to develop appropriate equipment for application.

2) Further research is needed on methods to create new FFLP farmer groups and a wider farmer network in the target area. to promote FFLP extension system should be investigated. The research will also find out the strategy how to work together of network in the village and between villages, districts and province should be done since it will make FFLP expand whole country.

5.5 Recommendations for applications of these results

1) Based on experience with FFLP, three criteria are important for farmer evaluation, namely, increase yield, high number of agricultural diversification activities and increase income. Many methods gave been done such as individually in interview, group discussion on farm, annual workshop and field visit both in villages and outsides. These evaluation methods can be used for future. However, the important issue is farmers' problems and what reasons which farmers need to adapt technologies, if we know exactly appropriate technologies will be presented or farmers can choose correctly. Then, to follow for monitoring and collecting data by using both interview and discussion will be done. The future evaluation should be traced at least once a year. However, FFLP can meet together very often especially during crop cultivating season. These can show the results of FFLP for expanding network and also for comparing with traditional extension in the villages.

2) In the future, if the FFLP has been adapted to implement in various villages, we should look for agricultural technologies have been used in the villages and where the sources of technologies, especially what other technologies they need to implement

on farms. The reasons of needs will be interviewed. These reasons will be modified for indicators when technologies have been evaluated such as farmers need to take liquid organic fertilizer for reduce cost and increase income, so key words of both issues will be used for indicators. Furthermore, the evaluation will concentrate on water use, source of water, labour both hired and in family, income from agro-processing based on using raw material from their farms, government project affect to FFLP, and marketing system including marketing needs.

3) The most important indicators to evaluate the agricultural activities on farm based on FFLP are farm income and agricultural diversification activities. These two indicators are relations. From three years experience with FFLP, FFLP technologies contributed 24 % to farm income and 21 % to total income. In 2008, FFLP farmers gained income from farms: FFLP activities, other agricultural diversification activities, and basic cropping system 86.6% of total income. This showed FFLP technologies and diversification activities were the main income of the households. Thus, the evaluation for new villages will focus on number of diversification, comparing sources of household incomes.

4) Local government known as TAO used FFLP effectively in many ways. They also asked FFLP to be the sources of learning farm in the communities for expansion the technologies and supported inputs to generate FFLP technologies, such as providing raw material and tools for making liquid organic fertilizer in four villages, proving fund for new cattle. Based on FFLP sustainability in the villages, TAO should monitor the activities in the villages by visiting FFLP farmers, organize the workshop for farmers to exchange experiences including provide opportunity and budget for farmers to learn more technologies to modify on their farms. New technologies that they modified will lead them gain more income and more diversification, that is based on water available.

5) One outcome of a farmer- to-farmer learning process is a set of farmers who have successfully used the on farm research process and have developed skills in sharing knowledge and experience with other farmers. They can share not only specific trial results but also methods of acquiring, adapting, and creating knowledge with other farmers and other villages. FFLP farmers can become the node of a farmer participatory research unit in the village, where farmers from other villages can come to

learn and participate the process. This can lead to development of new methods of farmer-to-farmer communication.

6) Farmers need to give feedback to researchers on both expected and unexpected results. When farmers do not use new knowledge to adapt or innovate, researchers should listen carefully and discuss with farmers problems, causes and effects of this result. This type of iterative diagnosis will enable farmers and researchers to develop more appropriate technologies

7) Various applications can be applied from this research such as : a) There is a democratic procedure in the formation and execution of the program; b) The program should be started with the simplest problem of farmers and leave difficult ones for future; c) The program should be so designed that it can give greatest benefit to the greatest number of people; d) The extension program should be made in consultation with village people through their local leaders, FFLP farmers, and organizations. e) Extension work is always to be based on the principles of helping to help themselves; f) extension work grows with level of understanding and skill of farmers and is adjusted on the basis of feedback from them