Chapter 1
Introduction

This research begins from the premise that agricultural extension in Thailand in general and the Northeast region in particular needs new methods to improve its effectiveness in responding to changing farmer needs. Diversification of agricultural activities is needed and desired by farmers in Northeast Thailand, but existing extension methods have not been very successful in increasing diversification. This introductory chapter begins by explaining key characteristics of agriculture in Thailand and the Northeast region, and why agricultural extension has been less effective in the Northeast. As a basis for developing an improved approach, the evolution of concepts and methods of agricultural extension is then reviewed. In particular, participatory approaches developed during the past 20 years and their limitations are examined.

Based on the above analysis of needs and existing extension approaches, this research developed and implemented a new approach, Farmer-to-Farmer Particpatory Learning (FFLP : I-san called So-Ray), over seven years. In the final chapter, conclusions about the overall effectiveness and the future potential of FFLP are discussed.

1.1 Background and Problem

1.1.1 The Need for Greater Agricultural Diversification in Northeast Thailand

Northeast Thailand consists of 19 provinces. Its agricultural land area, 9,3 million hectares, accounts for 44 percent of all agricultural land in Thailand, and the number of farm households, 2.8 million, represents 49 percent of Thai farm households (Ando, 2004). Farm size in the Northeast region is small, only 4.3 ha (25.7 rai) per farm, compared to 5.3 ha (31.8 rai) per farm in Central Thailand. The primary occupation of the population remains rice production. The fundamental problems for small scale rice farms are droughts and increasing costs of inputs. However, during the rainy season, high humidity and excessive water make the planting of crops other than

than rice difficult. Conversely, lack of water during the dry season is a main constraint to the cultivation of alternative crops after the rainy season.

Khon Kaen province is located in center of the Korat Basin of Northeast Thailand. It is characterized by a gently rolling topography with an average elevation of approximately 200 meters. Upland, upper paddy and lower paddy fields exist side-by-side in mini watersheds. Farmers typically plant glutinous rice in paddy fields primarily for household consumption while sugarcane and cassava are grown for cash in upland fields. Although sugarcane production can provide high income in good years, prices are affected by volatility in international markets, while production requires high investment costs. Other problems associated with sugarcane production include increased soil erosion and depletion of soil fertility by successive planting. After many years of declining production, cassava is playing a more important role again since the establishment in 2005 of an ethanol factory. This has lead to steady increases in the price of cassava.

Analysis of 174 non-irrigated farms from 50 sub-districts (*tambons*) in Khon Kaen Province showed that overall, farms derived 34% of their agricultural income from rice, 29% from field crops (primarily sugarcane and cassava), and 22% from animals, but only 15% from vegetables or other agricultural activities (fruit, flowers, or fish). The average value of a diversification index of the number of activities contributing at least 10% of agricultural income was only 1.7. This indicates that on the average, farms derived 90% or more of their agricultural income from one or two activities only. Non-traditional and highly diversified farms comprised only 6% of the total (Caldwell et al. 2007). Farmers recognize the problems associated with over-dependence on sugarcane and cash crops, but do not have good alternatives (Sukchan et al. 2004).

A future model for agricultural diversification in Thailand is called the “King’s New Theory.” This model, first proposed in 1999, is designed for small farmers with 2.5 ha of land under Thai ecological and economic conditions. Diversification of farm activities would increase the resilience of small farmers by reducing their economic dependence on industrial crops with high external input costs that are subject to the risks of global market price variation. Integrated agriculture technologies and diversity of both short term and long term production at the farm level would be designed to assure

self-sufficiency for a wide range of family needs (rice, vegetables, fruit, medicinal crops, animals, and fish), and at the same time enable farmers enter markets with a wider range of agricultural products. (Pholthani, 2009)

1.1.2 Agricultural Extension in Thailand; Characteristics and Change

The Department of Agricultural Extension (DOAE) is directly responsible for cooperating with research institutes, universities, agricultural credit agencies, marketing organizations, private companies and other related agencies to provide extension services and technology transfer to farmers, with the objectives of increasing farm productivity both qualitatively and quantitatively, and meeting market demands and standards. The ultimate goal of its activities is to improve the standard of living and quality of life of stakeholders in agricultural production, primarily farmers in rural areas.

Originally, DOAE was set up as a line agency of the Ministry of Agriculture, with Provincial Officers receiving direction from the central Department, and they in turn directing District officers. This centralized, top-down approach continued into the 1990s.

From the time the Green Revolution began in Thailand in the 1960s, the agricultural sector of Thailand has developed in response to market forces. Using the centralized approach, DOAE promoted monoculture crops, chemical fertilizers, and pesticides to increase production and maximize farmers' incomes, as well as generate foreign exchange for the country. Various problems arose from this approach, including forestland encroachment, water pollution, and soil erosion and degradation. Since the late 1990s, the Thai government has placed a high priority on addressing these problems. In this process, it has changed from a centralized system to a decentralized system with greater community participation.

The flagship program of decentralization is the Agricultural Technology Transfer and Service Center (ATSC). These are established at the sub-district (*tambon*) level. Their objective is to change the role of extension from a provider of information to serving as an information manager. Each ATSC should be a one-stop service center for farmers and communities in the areas of agricultural development, production, marketing and natural resource management (Narkwiboonwong, 2003).

The ATSC program was initiated in 2000, to accelerate farmer education, facilitate technology transfer and technological development, develop agricultural labor skills, and to continuously enhance the learning process for farmers to increase their earning and professional capacities. ATSC brings together all stakeholders in agriculture development, both national and local governments and local people themselves, to share problems and generate new ideas for local agriculture (Narkwiboonwong, 2003).

The process of agricultural development is thus changed to allow the local administration organization, farmers, cooperatives, farmer groups, and farmer institutions to participate and ensure an integrated response to community needs. The role of existing line agencies of the Ministry is to support integrated agricultural development and one-stop services through agricultural technology information on crops, livestock, and fisheries.

Initially, ATSC activities were to have been transferred to local Tambon Administration Organizations (TAO) by the end of 2003. Budgets were transferred to the TAOs in the 2004 fiscal year, but DOAE continued to supervise the ATSC until 2005. Then, in August 2005, ATSC was officially transferred completely to the TAOs. Their budgets for both administrative and agricultural income generating activities are now funded by the local administrations, while DOAE supports only technology transfer activities. The TOAs receive 35% of the annual extension budget (Samart, 2006).

At a present, many TAOs have recruited extensionists and begun implementing various projects on their own initiative. However, this is all very new for the TAOs, so they have continued to use methods of the old centralized extension system, such the Training and Visit approach, provision of inputs, and agent-designed, top-down activities. Moreover, many TAOs do not have enough budget and staff to carry out intensive activities with farmers, so they continue to rely on simpler methods similar to before decentralization. Not all TAOs have extension workers. Others have only newly-hired extensionists with inadequate knowledge and experience. Thus, the new decentralized agricultural extension system still cannot support farmers to increase production, reduce costs, and increase the diversification through the innovation of new, locally-appropriate technology.

All together, there are 99 core centers and 769 extended centers in the ATSC system. Within 76 provinces, 7,111 *tambons* will support agricultural development through ATSC. However, the number of Tambon Agricultural Extension (TAE) staff was only 4,618 in 2006. This means each TAE officer is responsible for an average of 1.5 ATSCs (Samart, 2006). Agricultural extension cannot carry out all the work envisioned for the ATSC only through publicly-supported TAE officers.

The above examination of the Thai extension system indicates that new methods are needed to achieve the goals of decentralization under conditions where the public sector alone lacks adequate budget and staff to carry out this work. The overall purpose of this research is to develop and test such a new method. As a basis for developing a new method, we will next review the evolution of concepts and methods of extension, including participatory methods developed since the 1990s.

1.2 The Evolution of Concepts and Methods of Extension

1.2.1 Concepts of extension.

Historically, agricultural extension has been considered as the application of scientific research and new knowledge to agricultural practices through farmer education. It has been described as a system of out-of-school education for rural people. Basically, the task of extension was to bring scientific knowledge to farm families to improve the efficiency of agriculture. A.H. Maunder, the former Chief of Agricultural Extension of the Food and Agriculture Organization of the United Nations in 1973, defined agricultural extension as 'a service or system which assists farm people, through educational procedures, in improving farming methods and techniques, increasing production efficiency and income, bettering their levels of living and lifting the social and educational standards of rural life" (Blackenburg, 1988).

Since the 1990s, there has been a basic change in the concept of extension. It is now seen as a system for facilitating information exchange and solving problems of farmers through a participatory approach. The extension is also the organized exchange of information and the purposive transfer of skills. The Neuchatel Group (1999) used the term "cultural extension" to facilitate interplay and nurture synergies within a total information system involving agricultural research, agricultural education and a vast complex of information providing businesses. Roling (1988) indicated that extension is

a professional communication intervention deployed by an institution to induce change in voluntary behavior with a presumed public or collective utility. Similarly, Leeuwis (2004) considered extension to be a series of embedded communicative interventions that are meant to develop innovations to resolve (usually multi-actor) problematic situations.

The practice of farmers and researchers working together to develop new agriculture technologies has been termed "farmer participatory research" (FPR) or "participatory technology development" (PTD). According to its advocates, the benefits of this approach are two fold: 1) locally-adapted improved technologies, and 2) improved experimentation capacities of farmers. Practical field experiences reveal that impressive results can be achieved when farmers and outsiders join hands. Farmers can transfer and learn from each other in the village through farmer-to-farmer learning.

1.2.2 The classic extension process : learning, adoption, and diffusion

Extension has traditionally been seen as a type of adult education. The work of an extensionist to be facilitation of farmer learning through the application of adult learning principles. Many suggestions for the improvement of extension officers' practice focus on the development of their skills as adult educators. However, farmer group must include the youth who want to work on farm and apply for farm youth club in the academic institutions. Thus, the technology transfer to these target group have to easy and two ways communication, especially, demonstration, on job training, discussion usually have been used.

It has been long recognized that extensionists cannot provide adult education to every individual farmer. After selected farmers have learned the new ideas and technologies that the extensionist teaches them, it is assumed that these new ideas and technologies will spread among farmers. This process is termed diffusion. Understanding this process enables extensionists to plan programs so that the advice they provide can be adopted by as many farmers as possible.

The process of diffusion is not instantaneous. When farmers actually use a new practice, this is called adoption. This rarely happens as a sudden change. More often, farmers adopt a new practice after they may have seen others using it for several years. Five stages can be recognized in the process of acceptance of a new idea leading to adoption of a new practice:

1) **Awareness :** The farmer learns of the existence of the idea but know little about it.

2) **Interest :** The farmers develops an interest in the idea and seeks more information.

3) **Evaluation :** The farmer considers how the practice may affects them, evaluating possible or expected benefits and difficulties. The farmer seeks more information for this purpose.

4) **Trial :** The farmer decides to try the practice provisionally on a small scale

5) **Adoption :** When the farmer is convinced by his or her own trial that the benefits of the new practice are indeed greater than its difficulties, he or she accepts the idea fully and the practice becomes part of their ordinary farming.

The spread of new technology was based on the diffusion of innovation concept developed by Roger in 1962. This concept assumes that transfer of technology and knowledge from scientists to farmers triggers development. Innovative farmers called "early adopters" adopt the new technology first, while others called "late adopters, followers, laggards" adopt more slowly. The model is widely referred to as the linear model as it assumes a linear, one way relationship between researchers, extension providers and farmers. Thus, the important role of the extension agent was mainly to assist farmers in putting ready-made technology developed by researcher into practice. Extension provided technology packages to farmers with little farmer participation in determining what technology was needed for which farmer needs.

1.2.3 The shift in learning and diffusion theory

Serveas (2003) has pointed out that during the last two decades the theory of communication in extension has undertaken a dramatic shift from a one-way, top-down transfer of messages by agricultural technicians to farmers, to a social process designed to bring together both groups-farmers and research and extension professionals - in a two-way sharing of information. This goes beyond a simple dissemination of information. The new approaches to extension are needs that make better use of knowledge among farmers. Rather than considering extension as mainly an act of transferring technologies to farmers for diffusion, extension, should concentrate on

facilitating the participation of farmers in the innovation process through experimentation in their own communities. Knowledge and information become tools for stimulation of a process of change. Instead of diffusion of pre-determined, packaged technologies, the expected outcome becomes stimulation of farmer development of new technologies through new knowledge and information.

In terms of the five steps of diffusion, the role of extension changes from a focus on the initial two steps, awareness and interest in specific technologies provided by research and taught by extension in an adult learning mode, to the middle and last three steps, stimulating and facilitating farmer experimentation with new knowledge and ideas. Usable technologies are created in and through the extension process.

1.2.4 Evolution of South and Southeast Asian extension systems

The evolution of agricultural extension in South and Southeast Asia can be broadly divided into four periods:

1) Colonial extension : Experiment stations were first established in many Asian countries by the colonial governments before World War II. The focus of attention was primarily on export crops such as rubber, tea, cotton and sugar. Technical advice was provided to plantation managers and large landowners. Assistance to small farmers who grew subsistence crops was very limited..

2) Diverse top-down extension : After independence, commodity-based extension services emerged from the colonial system, often with production targets established as part of five year development plans. Various programs were also initiated to meet the needs of small farmers, with support from foreign donors.

3) Unified top-down extension : During the 1970's and 1980's, the Training and Visit (T&V) system was introduced by World Bank to promote the adoption of Green Revolution technologies. The existing commodity-based extension organizations were merged into a single national extension service.

4) Diverse bottom-up extension : When World Bank funding came to an end, the T&V system could not be sustained in many countries, leaving behind a patchwork of programs and projects funded from various other sources. The decline of central planning, slow change in reined and unfavorable areas, and a growing concern for

sustainability and equity, all contributed to the development of participatory methods that gradually began to replace top-down approaches.

1.2.5 Changes in extension organization

There are, generally, five major types of extension system based on the body or sponsor responsible for the operation of system: 1) governmental type; 2) agricultural university type; 3) farmers' organization type; 4) industry-related type; and 5) private organization or information group type. Governmental types in turn may be managed in different ways:

1) Centralized organization

The national extension office directs all extension program activities, providing resources for regional or provincial, district, sub-district and village levels. Thailand and many other Southeast Asian countries have traditionally followed this organization type. Client participation and feedback in program planning are generally limited. This is considered most efficient in the earlier stages of development, but differences in natural conditions as well as socio-economic differences among farming communities and farmers engaged in production are not easily reflected in extension program. Its top-down nature tends to invites dependency on the government and discourages creativity and self-initiation in the long- term.

2) Decentralized organization

In this type of extension system, extension programming and resources are vested with state or provincial governments. The national or federal office is almost invisible. In South and Southeast Asia, principal examples are India and the Philippines. This type of system can more easily respond to the needs and problems of local communities and practicing farmers. However, problems may arise if the policies or interests of the provincial and /or local governments are different from those of the central government.

3) Cooperative type organization

In this type of extension organization form, there is a partnership between the national, state or provincial, and local governments for funding and managing extension activities and resources. This type of extension organization originated in the United States, where there is a partnership among the Federal Department of Agriculture, the

state land-grant university, and local governments. Japan has a cooperative extension system involving two public levels, the national government, and the prefectural government. In China, central, provincial, prefectural and county governments cooperate in organizing extension.

4) Pluralistic organization

Most recently, a more pluralistic type of extension system is emerging in many countries, although not always reflected in national extension policy. In this type, the need for public extension services is still recognized, but these alone have inadequate resources and staff. Many private organizations, such as NGOs, privately-funded development organizations, and industry, contribute to the overall agricultural extension program, together with the public service.

The development of the ASTC system with resources provided to District and Sub-district organizations (TAO) thus represents a change from centralized organization to a type of cooperative organization. But the limitations of resources and staff in the TAOs mean that Thailand needs to move towards a pluralistic organization.

1.2.6 Lessons from the Training and Visit System

The Training and Visit (T and V) system was based on the diffusion of innovation concept, but sought to strengthen it by facilitating stronger linkages between research and extension, greater professionalism of extension staff and improved management structure of extension. The system was based on trained extension staff and subject matter specialists making regular visits to contact farmers, according to a detailed schedule. The contact farmers were expected to adopt the extension message and spread it to other farmers in the community. The World Bank (1990) reported up to 50 countries adopted this system, and it dominated agricultural extension in Southeast/South Asia and Africa for more than two decades.

The results of T and V extension system has been evaluated by various experts. Some positives impact of T and V extension system were seen, in terms of rates of adoption, and increased yield, and increased farm productivity and profits in some areas, but overall the T and V system is currently considered to have largely been a failure. Although there were impressive gains in irrigated areas, it failed to make impact in a majority of reined areas. The T and V approach, moreover, proved to be too top

down with most important decisions being made at headquarter level. There was little flexibility for modifying the content of the extension message according to agroclimatic and socioeconomic diversity. Evaluation results suggest that the technical packages promoted were often inappropriate at the local level. Furthermore, the approach had high travel, training and workshop costs.

1.2.7 Paradigms of communication in different extension systems

An extension system can be characterized in terms of both how communication takes place (in the form of persuasion, or in the form of education), and the relationship between actors in the communication (paternalistic, where one actor presumed to have better or more complete knowledge than the recipient, and the flow of communication is one-way; or participatory, where both actors are presumed to have complementary knowledge, and the flow of communication is two-way). There are four possible combinations, each of which represents a different paradigm (NAFES. 2005):

1) Technology transfer : (persuasive + paternalistic)

This paradigm was prevalent in the colonial era, and reappeared in new form in 1970's and 1980's when the Training and Visit system (T&V) was established across Asia. Technology transfer involves a top-down approach the delivers specific recommendations to farmers about the practices they should adopt.

2) Advisory work : (persuasive + participatory)

This paradigm can be seen today where government organizations or private consulting companies respond to farmer enquiries with technical prescriptions. It also takes the form of projects managed by donor agencies and NGOs that use participatory approaches to promote pre-determined packages of technology.

3) Human resource development : (educational + paternalistic)

This paradigm dominated the earliest days of extension in Europe and North America, when university gave training to rural people who were too poor to attend full-time courses. It continues today in outreach activities of colleges around the world. Teaching methods is done in a unidirectional mode, from the teacher as the information source to the learner as information recipient, but the learners are adults who can make their own decisions about how to use the knowledge they acquire.

4) Facilitation for empowerment : (educational + participatory)

This paradigm is used in methods such as experiential learning and farmer–to-farmer exchanges. Knowledge is gained through an interactive process and the participants are encouraged to make their own decisions. In Asia, the Farmer Field School (FFS) and other participatory technology development programs are examples of this paradigm.

1.3 Farmer-to-Farmer Approaches

1.3.1 Reasons for emergence

With the shift from centralized governmental extension to decentralized and pluralistic extension, especially in the context of reduced public resources, and in light of the lessons learned from the inadequacies of the centralized T and V system, farmer-to-farmer approaches have come to the forefront. The impossibility of a repeat of the widespread effects of the Green Revolution. Future gains in agricultural productivity through technological innovation will have to be more incremental., locally specific and oriented towards specific farmer constraints. The need for locally-specific technological innovation mean that, if agricultural research and extension are to be effective, its agendas and outputs will have to be more demand-led than in the past. For extension, it means helping farmer toward sustainable increasing productivity, particularly in small scale mixed farming system in rainfed areas, and including in neglected areas. Thus, this will require agricultural extension system which farmers to organize themselves in ways which empower them. This section reviews the Farmer Field School (FFS) approach and other experiences in Asia, and summarizes key characteristics of farmer-to-farmer extension approaches.

1.3.2 Learning process in the Farmer Field School (FFS) Approach

The FFS approach grew out of the T and V process at the end of 1980s in Indonesia. It arose from rice insect outbreaks to which conventional extension and T and V were unable to respond. FFS is often described as a “school without wall” that provided a forum where farmers could make regular field observations and learn from them. The learning process in the FFS was based on key principles related to attitudes,

the farmer-trainer relationship, and sources of information for learning. summarized the five key principles of FFS as follows:

1) What is relevant and meaningful is decided by the learner and must be discovered by the learner. Learning flourishes in a situation in which teaching is seen as a facilitating process that assists the farmer to discover from experiments in the field;

2) Learning is a consequence of experience. People become responsible when they have assumed responsibility and experience success;

3) Cooperative approaches are enabling. As people invest in collaborative group approaches, they develop a better sense of their own worth;

4) Learning is an evolutionary process and is characterized by free and open communication, confrontation, acceptance, respect and the right to make mistakes;

5) Each person's experience of reality is unique. Through experimentation (testing), they become more aware of their own style of learning and action as shown in Figure 1.

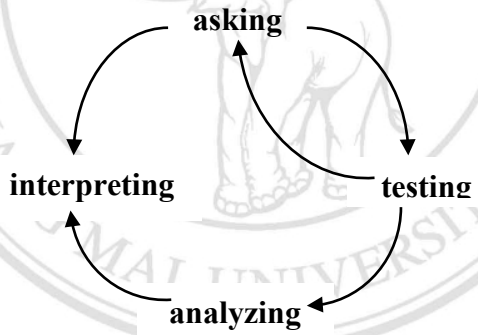

Figure 1 Learning process of farmer field research

Martaamidjaja and Anwarhan (2004) considered FFS as a method of facilitating farmers to do research in their own fields and use the results for the management of their farms. The FFS program includes self–generated materials from the farmer own rice fields; training and learning over a whole crop season; a deliberate effort to build farmers' organizations around IPM activities, and horizontal communication between farmers. The whole process is one in which the experts become farmers and the farmers become experts.

1.3.3 Other examples of farmer-to-farmer approach

The power of farmer learning was demonstrated in the apprenticeship program begun by FAO in 1990 (Martaamidjaja and Anwarhan, 2004). The goal of the apprenticeship program was to help African countries increase rice production through farmer-to-farmer learning from Indonesian farmers. The program enabled selected African participants to have practical learning experiences through interaction with Indonesian host-farmers who served as facilitators for rice learning. Structured training complemented the farmer-to-farmer learning process (Martaamidjaja and Anwarhan, 2004). Results showed that many of the African farmers were able to successfully apply on their own farms what they have learnt from their Indonesian counterpart farmers. In the World Education project farmers developed critical ecological decision-making and leadership skills that increased the productivity of their farms. The program did this by supporting the farmer group learning process through IPM farmer field schools and linking groups together in a local network.

Pandit (1995) describes how the Nepal Agro-forestry Foundation (NAF) developed farmer-led learning in extension after trying various other approaches to extension. NAF's program followed the following five steps:

- Step 1 : develop a contract among farmers, a grassroots NGO, and NAF;
- Step 2 : exposure and cross-visits to motivate farmers to adapt specific technologies;
- Step 3 : formation of a farmer group;
- Step 4 : training farmer leaders for supporting and following up activities;
- Step 5 : promotion of community management of the farmer-to-farmer program.

NAF's program can be viewed as an example of the transition to a pluralistic type of extension organization. Although it began with a technology focus, it gradually developed capability in the community to take over the process. One example is a farmer-based extension and participatory research system in the uplands of Sumba Island, Indonesia. The program started by introducing basic soil and water conservation practice to a few farmers and now serves nearly 3,000 farmers in 30 villages. It has developed many strategies to facilitate the development and spread of farmer – led approaches to extension and research.

IFAD (2003) developed farmer-to-farmer exchanges that can improve community relations and lead to greater involvement and commitment of producers. Local know-how, especially of experienced farmers and knowledgeable elders, can smooth the transition and reduce risks with specific crops and agro-ecological conditions. Governmental extension encouraged this by formally acknowledging their value as "innovative farmers."

The CIAL approach (Ashby et al. 2002) is a farmer-based research service answerable to the local community. The community elects a committees to serve. The CIAL conducts research on priority topics identified through a diagnostic process, in which all are invited to participate. After each experiment the CIAL reports its results back to the community. The steps in the CIAL process consists of 1) motivation, 2) election, 3) diagnosis, 4) planning, 5) experimentation, 6) evaluation, 7) analysis and 8) feedback.

1.3.4 A theoretical basis for farmer-to-farmer extension and learning

Classic farmer-to-farmer extension was based on the training of farmers, often through the creation of a structure of farmer-promoters and farmer-trainers. Farmer-promoters were usually individuals with little or no formal education who, through a process of training, experimentation, learning and practice, increase their knowledge and become capable of sharing it with others, functioning as extension workers. The role of farmer-promoters in rural communities was that of a change agent promoting rural development processes (Scarborough et al. 1997). Farmers in classic farmer-to-farmer extension have also been called paraprofessionals, community educators, rural promoters, farmer extension workers, local facilitators, community promoters, and indigenous facilitators (Julia, 2002). This type of farmer-to-farmer learning can be seen as another tool of professionally-led public extension.

Farmer-to-farmer learning today aims to be more farmer-initiated. Its objectives are to enable small-scale farmers in the developing world to gain insight into the performance of their management and to learn from comparing their performance with that of colleague farmers. The acquisition of information and its transformation through experimentation, and the importance of social learning, form the core elements of a theory of farmer-to-farmer learning .

Importantly, a farmer-to-farmer learning process has two key components: 1) grasping of information through the conceptualization of experience, and 2) transformation of information into knowledge through reflection on experimentation. The two key words here are, 1) experience as a basis for understanding new information, and 2) experimentation as a basis for changing information into usable knowledge.

Millar and Curtis (1997) emphasize that farmer knowledge is drawn upon and enhanced by social learning in groups. When farmers come together and exchange information among themselves and with scientists or extension agents, the interchange of knowledge has a synergistic effect. It allows local knowledge to be broadened and strengthened, and scientific knowledge to be adapted and modified to local situations. The overall goal of a farmer learning process to be the creation of a space where practitioners (farmers) can learn from each other and become more productive and profitable. The practitioners themselves have a wealth of untapped knowledge.

Bunch (1982) described the principles upon farmer-to-farmer systems of extension are presently based, namely: 1) motivate farmers to experiment with new technologies on small scale, 2) use rapid, recognizable success in experiments to motivate others to innovate, 3) use technologies that rely on inexpensive, locally available resources, 4) begin with a limited number of technologies to retain focus, and 5) train farmer as extensionists and support them in teaching other farmers.

1.3.5 Methods of farmer-to-farmer learning

As we have seen, the core of farmer-to-farmer learning is discovery, learning, and improvement through experimentation, and exchange of knowledge in a social environment. Specific methods will depend on the natural and social environment, agricultural production system, and problems encountered in each situation. Some common elements can be identified. The following common elements of farmer-to-farmer learning:

1) Farmer-centered development : An enabling environment is created to facilitate farmers to develop by themselves. Development refers not only to increased farmer knowledge and capacity, but also to improved morale.

2) Active participation of farmers : Active participation means that farmers assume a major role in decision-making. This builds the confidence in farmers that they can make decisions on how to solve the problems they themselves identify.

3) Interactive learning through action : Learning is done through a group process in steps: 1) bring people together, 2) brain storming 3) working together, 4) summarize lessons learned and 5) accepting the outcomes together. This learning process results in adjustments in values, attitudes and the ways of thinking and working together among the different farmers involved in learning through action.

4) Networking of farmers and groups : The exchange and interaction between individual farmers or farmer groups improves interactive learning and participatory technology development and transfer.

5) Focus on self reliance : An emphasis is placed on self-reliance by mobilizing social capital, local wisdom and natural resources for sustainable rural development.

Furthermore, the following farmer-to-farmer educational strategies for building local learning networks :

1) Farmers serving as examples, workshop speakers, case profiles, or farm tour hosts.

2) Farmer networks, both informal and formal with regular meetings.

3) Farmers discussion groups

4) Farmer mentors, involving pairing of an experienced farmer with those needing new knowledge, in a one - on - one relationship.

5) Farmer mentor training, to help experienced farmers become more effective teachers.

6) On-farm internships, to provide on–farm experience and mentoring

7) Farmer cooperation, in which a group of producers set specific goals for working together.

Bunch (1982) proposed the following key elements for farmer experimentation: 1) motivation of farmers to experiment with new technologies on a small scale; 2) using rapid, recognizable success in these experiments to motivate others to innovate; 3) focusing on technologies that rely on inexpensive, locally available resources;

4) beginning with a limited number of technologies to retain focus; and 5) training of villagers as extensionists and supporting them in methods of teaching other farmers.

A farmer-to-farmer learning process contributes to improvement of agricultural production in two ways. First, each farmer gains direct insight in his or her own performance through experimentation, analysis, and explanation to other farmers. Second, farmers gain information indirectly from their peers and by comparing themselves with their peers' experiences. Techniques to reinforce these two learning paths are: 1) having farmer register inputs and outputs by activity, so that each can analyze which activities contribute the most to the difference in performance: 2) establishing a learning group where farmers discuss the results and ask questions to one other on how to each could improve their performance.

1.3.6 An unresolved methodological need-scaling out and up beyond one village

Farmer-to-farmer approaches have tended to be village-specific. Participatory on-farm experimentation has generally been focused on one village, with intensive support from researchers as well as extensionists. Methods for extending the impact of participatory experimentation over units larger than a village, such as a sub-region of a province, a whole province, or a group of similar provinces, are collectively called scaling up. Although this term is widely used, methods have not been well-established.

Scaling out can be defined as the process of working with farmers to enable beneficial technologies to be adapted across a wide rang of people and farming system to improve their livelihood (Miller et al., 2005). Furthermore, the scaling up leads to more quality benefits to more people over a wider geographic area more quickly, more equitably, and more lastingly (Menter at al., 2005). The term scaling up refers to applying similar processes to a larger unit. It is different from simple dissemination of a given technology over a wide area by extension Researchers use the term scaling out to refer to a process of making technology development applicable across similar size units making up a larger unit at a higher scale. This has also been called "horizontal scaling up" (Menter et al., 2005).

The aggregation of the effects of repeated scaling out can result in scaling up, as the process and its results become characteristic of the larger unit. In essence, scaling out can be seen as an iterative approach to scaling up. Furthermore, an example of

horizontal scaling up (often referred to as scaling out) could be the adoption in different communities, ***vertical scaling up*** may mean moving from individual to collective decision making, or it may involve moving from simple organizations based on face-to-face interaction to complex, hierarchical.

Millar and Photakoun (2006) implemented the improving extension method in Lao, PDR indicated that the scaling out could occur using three pathways: 1) introduce the proven technologies and their potential impact to new village, 2) encourage enable more farmers within existing project villages to take advantage of the technologies being used by other farmers, adapt them to their own farming system and benefit from the impacts, and 3) introduce the technology to other development projects. The result found that although the aim of scaling out technologies is to reach as many potential in the shortest time (i.e. to accelerate impacts), the choice of methods for scaling out can be critical to who participate, farmer learning process and potential long term benefits. Thus, moving from participatory research with individual farmers to scaling out requires that researchers and extensionists develop new knowledge and skills to work within and between communities (Snapp and Heong, 2003).

The scaling up process required to reach large number of clients which is one of the main challenges that face researchers and advisor who are the public supported. Government extension systems were set up to reach rural populations. They charged with extending technologies and working with less-advantage people in the communities. However, Chambers et al., (1987) indicated that normally resource-poor farmers reap few benefits from public services. Snapp and Heong (2003) described one growing problem is that extension systems suffer from declining numbers of extension personnel, and farmers' access to new information is often very limited.

According to former agricultural extension system has faces various problems, especially bottom up policy so agricultural activities did not farmer needs, lack of budget since much finance paid for salary and administration, lack of following from training and visit (T and V) and number of extentionists reduced. Thus, the new era of agricultural extension system will be investigate to solve these difficulties such farmer approach, farmer participate in the process and others. This research will investigate new agricultural extension system in terms of farmer- to- farmer learning process (FFLP) by studying the process, results and network building.

1.4 Objectives

The main point of this research is to develop a new approach to farmer-to-farmer learning appropriate for a decentralized, pluralistic extension system in which farmer initiative and innovation form the core of extension activities. This approach will go beyond the Farmer Field School approach, which is structured for learning in the field to solve specific problems. The approach will be based on social learning through experimentation, rather than on individual learning through transfer of packaged technology, as in the centralized Training and Visit system. The approach will go beyond the single village as the forum for social learning, to create a regional network for social learning, as a method of scaling out. It will be a form of induced diffusion of farmer-generated innovations, rather than relying on natural diffusion of research-induced innovations. We term this approach to induced diffusion of farmer-generated innovations, "Farmer-to-Farmer Learning Process (FFLP)."

In this research, we will carry out a real-world test of the introduction of FFLP in selected villages in a target area in Northeast Thailand chosen for this purpose, and assess its effectiveness. We establish three objectives for this assessment:

1.4.1 To develop the agricultural extension method by farmer-to-farmer learning process in Northeast Thailand

1.4.2 To assess of farmer-to-farmer learning process on introduced technology in agricultural extension

1.4.3 To study the results of farmer- to- farmer learning process on network building.

1.5 Overall hypothesis

The use of the FFLP approach 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 and also build network.

1.6 Research design

1.6.1 Area

The research area was five Districts (*amphoes)* in Khon Kaen province, Northeast Thailand . Selection of these districts was done with the Provincial Extension Office.

To identify farmers to involve in the scaling out process, a census of all eight *tambons* was first carried out This census had the objective of developing a frame for selection of farmers based on three factors: 1) presence or absence of ponds; 2) diversification types, and 3) diversification level. Diversification types were defined as eight combinations of three income-generating agricultural activities that use water from ponds: livestock (L), fruit (F), and vegetables (V). Diversification level was defined as the number of such activities on the farm, with a range from 0 to 3. Over four levels of diversification, there were a total of eight diversification types: level 0 (no activities); level 1 (L, F, or V); level 2 (LF, LV, or FV), and level 3 (LFV).

1.6.1.1 Contents

The contents of this research will study on eight main issues as:

1) Socio-economic of farmers such as sex, age, education, member of household. labour force in family, farm pond income both from farm and off farm.

2) Learning development and adaptation of technology such as : FFLP, introduced technology and adaptation, characteristic of introduced technology.

3) Results on economic and number of intergrated agricultural activities such as: farm income from 1-3 activities, income from basic agricultural activities.

4) Study on FFLP such as : the step of learning, dissemination by FFLP, adaptation by FFLP.

5) Study income from basic agricultural activities (rice, sugarcane and cassava) with integrated activities and introduced activities**.**

6) Study on FFLP dissemination to Tambol Administration organization (TAO) such as: learning process, utilizing FFLP and benefit to farmer.

7) FFLP network building such as: with technology, network in other districts in Khon Kaen, income of farmer in scaling up areas.

8) Study on results & FFLP look in philosophy sufficiency economy.

Next chapter will present about the literature reviewed both involved in learning theory, research philosophy of sufficiency economy information and economic in Northeast region Thailand.