

Transforming agri-food systems in peri-urban area of Northern Thailand: A case study of vegetable farming of Ban Ping Noi farmers

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Abstract: *Smallholder farmers practising conventional farming systems with high chemical inputs have shown new trends of change to reduce production cost and respond to increased consumers' demand of clean and safe agri-food products. The pesticide-free vegetable production system, a transitional practice between safe-use and organic farming practice, is considered to be more technically feasible and affordable by smallholder farmers in peri-urban areas. This paper is based on the work done by the Multiple Cropping Center (MCC), Chiang Mai University, to undertake an initiative of transforming sustainable pesticide-free vegetable farming system in peri-urban areas of Chiang Mai province in Northern Thailand. Using case study and farmer-researcher partnership approach, the paper traces the evolutionary processes whereby self-organizing farmer groups have changed their farming concepts and practices by converting from chemically based to pesticide-free vegetable farming systems, and identifies key driving forces of change. It also highlights the resultant impacts on the farming structure and livelihoods. The key driving forces include farmer's new paradigm in agri-food systems which focus on values orientation; the consumer interaction helps improved farm production, quality performance and diversity; the marketing alliance with supermarket provides stable daily income, but regulative barriers and not-immediate cash payment also prohibit farmer entrance. Community market specifically created for pesticide-free agri-food system is the main outlet for smallholder farmers, but its sustainability depends on social coordination, farmers' trustworthiness and ethical relations between farmers and consumers. The agro-biodiversity is the key to farming resilience, but it is knowledge intensive and requires constant adjustment.*

Keywords: *transformation, agri-food system, peri-urban agriculture, agro-biodiversity*

Introduction

There are increasing concerns about health and environmental impacts of chemically based intensive agriculture and food systems in Thailand. Several initiatives on low external input sustainable agriculture, and integrated farming systems to produce clean and safe agri-food products have been promoted by both governmental agencies and non-governmental organizations (NGOs), as well as private agri-food distributors and processing companies. The production of these clean and safe agri-food system including safe-use of pesticides, pesticide-free, as well as organically produced farming practices have been developed by individual farmers, farmers groups, either independently or in partnership with private agri-food companies, in response to increasing consumers' demands both locally and globally.

The transformation process from conventional farming practices which are resources-and product-based to process-values based agri-food economy requires several changes and adaptation. As theorized by Barham (2002), the values-based labeling efforts focus on process and quality. The labeling is primarily a social movement motivated by the need to re-embed the agri-food economy into the larger social economy, whereby farmers, as one of the key actors, put their moral and ethical convictions into practice through engagement with the market. In this respect, the values of clean and safe farming practices will cover range of domains beyond economic, including environmental, social, ethical, or combination of values, such as locally grown, organics, pesticide-free agri-food products, etc. The implication is that a new paradigm in agriculture is needed to approach farming as an holistic, integrated enterprise (Els, 1996; Henning, 1998). In practice, the integrated and dynamic farm systems distinguish themselves from the conventional farming by prevention in management

and tendency towards integration of agricultural activities into nature, rather than controlling environment by technologies (Francis et al., 2003; Dantsis et al., 2009). This alternative approach of farming, such as low external input sustainable agriculture, organic farming, pesticide-free farming systems, often retain the central features of integration and recycling, including an emphasis on small, diverse, mixed operation, marketing directly and locally to consumers (Hall and Mogyorody, 2002).

Coupling with transformation of farming practices, new forms of quality-food market have also emerged in the agri-food systems which are becoming more differentiated based on consumer demand for distinctive food quality, networks of producers and consumers, embeddedness and trust (Marsden, 1998; Murdoch et al., 2000). The changes are the results of configuration of socio-economic, technological and ecological components that are constantly interact to produce agri-food production systems through time. The sustainable agriculture, integrated farming systems, and organic agriculture movement in Thailand and in the regions are a few examples.

Ban Ping Noi, is located in Tambon (sub-district) San Sai, Saraphi district, Chinag Mai Province, and a forty minute drive from Chiang Mai city. The area is facilitated with year-round irrigation water serviced by a communal diversion weir system. The farmers are primarily peri-urban smallholders who traditionally engaged in rice-based farming systems, including rice-garlic-vegetables, rice-soybean-vegetables. The systems had gradually phased out since the mid-80s when the Ministry of Agriculture and Cooperatives (MOAC) initiated “crop diversification programme” urging farmers to substitute rice-based farming systems to horticultural fruit-tree, vegetable based systems (Waneesorn, 2004). The diversification program was one coping strategy of MOAC to reduce price risk of rice, by promoting horticultural crops which were likely to be more market and price stable than rice. All farmers of Ban Ping Noi joined the programme, focusing on longan (*Dimocarpus longan*) fruit tree and vegetable crop. Farmers converted their lowland paddy fields by making 3-4 m raised beds separated by 1.0-1.5 m trenches as drainage system. The Department of Agricultural extension (DOAE), the implementing agency provided all free fruit seedlings and vegetable seeds to the converted farmers.

As the consequence, Ban Ping Noi and majority of Saraphi district has covered with longan tree landscape, intercropped with vegetables on the raised beds system, The key vegetables introduced and quickly adopted by farmers were Chinese cabbage (*Brassica chinensis*), chili pepper (*Capsicum frutescens*), egg plant (*Solanum melongena*), etc. The Chinese cabbage is short maturing vegetables, harvesting within 48 days after seeding, while chili pepper, a long maturing crop, is normally intercropped in mid-December, and giving its first harvest in February when the crop canopy provides full ground cover, thereafter at weekly interval until June. Farmers will have their cash cropping design to include crops with quick turn-around time, and one with longer productive time.

Farmers normally cultivate their short seasoned vegetables as monoculture, with heavy inputs of chemical fertilizers and pesticides and herbicides. The availability of year-round irrigation water, close proximity to the city and local traders have made Ban Ping Noi become a favourable vegetable production site in peri-urban area.

Farmers in Ban Ping Noi had experienced the land use change from rice based to fruit tree and vegetable based systems during the mid 80s. Beginning the eighth (1997-2001) and through the ninth (2002-2006) National Economic and Social development Plans, the MOAC started to promote environmentally friendly sustainable agriculture in response to growing public concern over health and environmental impacts of chemically based intensive agriculture. The Department of Agriculture had come up with Good Agricultural Practices (GAP) to provide production guidelines of resource efficient management packages for major commodities, and the Ministry of Public Health (MOPH) also came up with “Clean Food Good Health” campaign. The DOAE, with close collaboration with FAO, adopted farmer field school (FFS) approach to empower farmers’ capability in integrated pest management (IPM), with initial undertaking on rice production with subsequent extension to fruit trees and vegetable crops. The DOAE staged pesticide-free in crop production campaign and announced the year 2004 as “Food safety year 2004” (Waneesorn, 2004).

Objectives

This paper is based on the work done by Sustainable Agriculture Unit of the Multiple Cropping Center (MCC), Chiang Mai University, to undertake farmer participatory research approach in converting chemically based into pesticide free vegetable farming systems in peri-urban area of Chiang Mai province, Northern Thailand. The paper examines the factors affecting the process of change in attitudes and practices of farmers, and identifies barriers to convert from chemically based to pesticide-free vegetable farming systems. It also highlights the resultant impacts on the farming structure and livelihoods. The conversion is a shared learning process among farmers, and between farmers and researchers. Results from farmers' observation and findings, new information, technologies and concepts are communicated during the regular farmer meetings at the site.

Methodology

The farmer participatory research approach is applied to collaborate with farmers in Ban Ping Noi, Chiang Mai province, to transform conventional chemically based vegetable farming systems into alternative pesticide-free farming practices. The initiative began in early 2002 when the researchers helped facilitate the farmer learning processes through farmer field school approach. Weekly meeting at the site was carried out to discuss relevant issues and farmers' field observation and experiment results on alternative production as compared to the neighbor's conventional production plots. The FFS approach in the early stage had created mutual trust and collegiate relationship which forms the strong foundation for present day farmer-led participatory action research. The data and information acquisition were mainly in the form of farmer dialogue and consultation. In subsequent years, the researchers through regular farm visits had provided advisory roles, providing relevant information and contacts to benefit farmer coping management to change. As vegetable production from the alternative practice and market access and entry became stabilized, the adopted farmers began to diversify their farming enterprises, and formed partnerships with local as well as central state institutions for testing and developing new initiatives. The temporal setting of change of a representative key farmer is shown in Figure 1. The research findings and presentation is based on qualitative analysis approach supported by farm visits, participant observation and farmer dialogues.

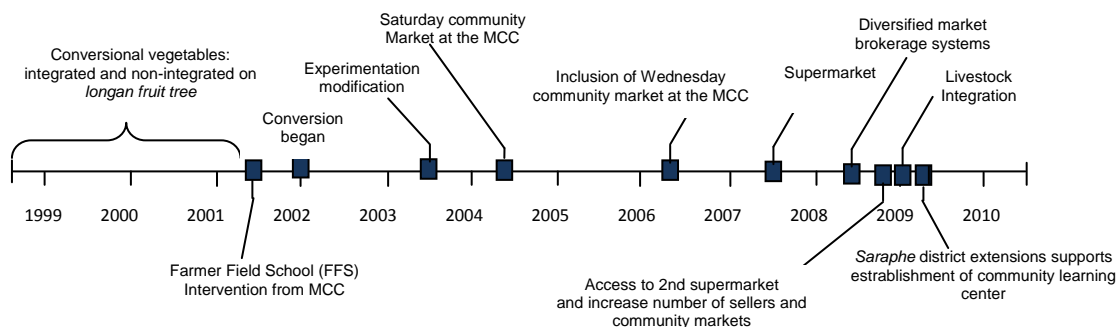


Figure 1 Transformation of pesticide free vegetable farming systems in Ban Ping Noi

Results and discussion

Agricultural transformation

A group of 13 vegetable farmers, who were formerly rice farmers and were participated in the agricultural diversification program of the DOAE in the mid 80s by converting their rice land to fruit orchards and vegetable production, were the first group taking initiative to make another production

conversion. The transformation process from conventional to alternative pesticide-free vegetable farming systems involved unconventional learning approaches.

The situation analysis and agro-ecological characterization of Ban Ping Noi were carried out with farmers group prior to farmer-field school learning process. During the session, individual farmers' attitudes towards pesticide-free vegetable production and its implication as well as associated management issues were better comprehended. Majority were concerned about market access, and farming design that would provide production stability. The study visit to the Multiple Cropping Center (MCC) where pesticide-free vegetable production had been carried out over years was organized for farmer group to see how agro-ecological principles work in practice. Farmers were aware of significance of agro-biodiversity in vegetable polyculture system in balancing host-pest-predator relationship. The past failure of integrated pest management (IPM) system in vegetable farming was due to monoculture. The vegetable monoculture is vulnerable to pests and diseases and is ecologically unstable. The MCC model that works consists of a few key elements: diversity of vegetable species, each planted on small plots on rotation; vegetable species can be of two groups, one is the core group capable of almost year-round production, the other group is seasonal; mechanical insect control is installed to reduce pest population, such as yellow insect trap. The small plots and rotational cropping would allow efficient use of family labor. To have value added, the harvested products are graded and packed for consumer convenience. So the value is based on quality rather than quantity.

The FFS, which run for the whole vegetable seasons for almost two months at weekly intervals, proved to be intensive for some farmers. Farmers shared their knowledge and experiences and designed their own programs with technical support and guidance from the researchers. Field monitoring session was very effective in learning about pest incidence, pest life cycle, and its relationships with crop cycle. The DOAE's Chiang Mai Biological Pest Control Unit was invited to organize the session on the use of natural enemy, and biological agents in controlling vegetable pests. This was then followed by the study visit to the Unit to learn how the natural enemy was reproduced, maintained, and released in the field. The visit to community market offered farmers' opportunity to learn about consumers' behaviours and preferences.

The design of pesticide-free vegetable production is based on key concept of agro-ecology with the use of species diversity to create co-evolving relationship between pests and host plants. The first production cycle consisting of six species collectively selected by and based on farmers' experience and preferences began in early January 2002 when the first FFS session began. At the end of the 10-week FFS session, only one farmer was determined to continue with polyculture system, while the rest had withdrawn and gone back to monoculture.

Through participant observation and reflection with farmers on the pesticide-free vegetable initiative, the factors affecting the process of change in the attitudes and practices of farmers were as follows:

- The adopted farmer had shifted his paradigm from conventional diversification to new paradigm of alternative polyculture system without using chemical pesticides. Such a shift requires revolutionary thinking as the result of discontent of conventional system. Such attitude is based on sustainable development where the growth of farm income can only occur within the limit of the ecosystem. While the dis-adopted farmers have not changed their world view, but continued to cling to conventional techno-centric approach of solving biological stress in vegetable farming. Many local NGOs and religious group in Northern Thailand who advocate organic farming always value the importance of paradigm shift towards sustainable development, and would spend time of "cleaning the mind" process before going into production practice.
- The support of family members is very crucial for making changes. The adopted farmer has full support from his spouse, both works shoulder to shoulder on the farm. In subsequent years when the farm develops further, there is division of labor when the husband delivers farm produce to market and the wife takes care of farm, and makes all the farm account. The

farm record is the big change as farmer engages in agri-business. The system helps farmers make better farm planning. Farm recording is not commonly practiced by Thai farmers. The project of farm recording has now being instituted by the Bank for Agriculture and Agricultural Cooperatives (BAAC) to introduce for all farmer clientele. As the production systems become stabilized, and production increases, the husband and wife team has invited their daughter and son-in-law to join the agri-business venture, and become a full time farmer-entrepreneur.

Majority of dis-adopted farmers do not have full support from their spouses, who often have their own non-farm business engagement.

- The practice of vegetable-based polyculture hardly allows farmer to have other non-farm engagement. The system of practice has regular and almost fixed schedule, such as harvesting in the afternoon, grading, and delivering in the morning. Field management for weed control is carried out in the morning after product delivery to the market. While the monoculture system has more flexibility, hired labor would be arranged when family labor could not cope with cultural practice such as weeding and harvesting on the bigger plots.
- The adopted farmer has to deal with market personally. When dealing with supermarket or big retailer, farmer would receive payment either at weekly or at fortnight intervals. Many farmers are not keen on marketing, they would prefer to sell products through local traders or brokers and receive cash payment on the spot.
- The dis-adopted farmers had favored the monoculture upon which lump sum of income could be generated, while polyculture provided small daily income. In addition, the local traders were not interested in buying small quantity of many species of vegetables; they preferred to trade on large volume to fill up the truck load. The adopted farmer subsequently had to search for sustainable chain alliances to market pesticide-free and quality vegetable products.
- The dis-adopted farmers have gone back to conventional systems with certain modifications, such as inclusion of two to three vegetable species on larger plots that are harvested as bulk; application of safe-use of chemicals to reduce chemical use, and distributing farm produce through local traders.

The FFS learning process has been proved to be more successful with IPM in rice, as the grain crop does not require full time attendance. On the contrary, the vegetable polyculture system is practically a full time farming activity. The vegetables are perishable with short shelf-life, and do require quick delivery. Post-harvest handling through grading for value addition requires precise labor management, and sometime can be time consuming. With bulk harvest and handling, grading is less essential, and all work practically finishes after harvest at the field when the local traders would do all the transporting to the wholesale or distributing to retail markets.

The FFS learning process essentially focuses on farmer capacity building, improving self-learning capability through learning-by-doing, so that farmers can learn, adopt and adapt new technologies and disseminate them to other farmers. But to change the mind set or world view, from conventional to pesticide-free, and to organic, require more than technological change.

The dis-adopted farmers have developed their own choices, many are engaging in non-farm activities, others are more focusing on longan fruit drying and processing which requires larger financial assets to handle from purchasing of fresh products to processing dry products and marketing. The longan processing will not be compatible with pesticide-free vegetable production as the former requires intensive business arrangement during the fruiting season from July-August.

The FFS process has enabled farmers to learn, integrate with their own knowledge, consolidate into their new knowledge, and internalize through practices so that become their knowledge. The process has benefited farmers in doing science-based farming. It is time consuming and very intensive, but it has proved to be effective in empowering farmers' capacity as being observed from the progress

made by the farmer-adopter of Ban Ping Noi. The FFS learning process in combination with farmer-consumer interaction will greatly enhance farmer's capacity and performance.

Enhancing production stability

The adopted farmer continued to experiment with varieties of vegetable species by planting on small production plots, observing growth behavior and yielding performance, particularly species reaction to pests and diseases. Selection of species was based on several sources of information, for instance from farmers, researchers, local traders, and from consumers in the community markets. Over 30 species of both common and local vegetable species were tested for adaptability. It took farmer over two years of modification and adjustment before the overall production began to stabilize.

The adopted farmer has followed the MCC model of integrated pest management practice by placing yellow traps over the plots but as the vegetable diversity increases, pest incidence is minimal and pest damage is accepted as natural phenomenon. Farmer has developed a set of core group of vegetables that are capable of producing almost all year-round, and they are common in daily diet of Thai people. These include: Chinese cabbage, Chinese kale, watercress (water convolvulus), indigenous green okra (lady's finger), Thai eggplant, winged bean, lettuce, holy basil, sweet basil, and bitter cucumber. Other seasonal vegetables are incorporated to make a total of over 20 species per season, such as cauliflower, purple eggplant, yard long bean, broccoli, angled luffa, spinach, cucumber, celery, Ceylon spinach, coriander, Chinese Emperor cabbage, Cayenne pepper, etc.

The core group of vegetables is becoming the farmer's speciality, where his farm is able to provide daily supply to big retailer, such as Carrefour. As the vegetables are used daily as Thai cuisine, the core vegetables have provided stable daily income. The products are not sold as bulk, but the harvested materials are graded and packed in small bags with the price tag ranging from Baht 5 to 25 (US\$ 0.15 to 0.75). Farmer has perceived product quality more important than quantity of yield per unit area, and would concentrate on plant materials that are ready for market by selective harvesting. Farmer can anticipate the daily income by counting number of packages delivered to markets. At Carrefour, farmer receives average daily income of Baht 2200 (US\$70) after 15 percent deduction for commission.

The use of agro-biodiversity in the farming system design has been effective in reducing pest damage to a non-critical level. The dynamics of species interaction coupled with integrated nutrient management, has enabled farmer to gradually build up production stability after the third year. Farmer has increased the proportion of organic fertilizers in the integrated nutrient management, and currently the use of chemical fertilizer has been reduced to more than half. Farmer is now developing towards organics when livestock is integrated into the system.

Farmer-consumer interaction

In the early stage of development of pesticide-free vegetable production, it is anticipated that this specialized product which is based on quality would be sold directly on "above average market" where the consumers are more concerned about health, nutrition and environment, and the market is composed of interpersonal negotiations (Murdoch and Miele, 1999). It has been argued that the conventional agri-food system with conventional markets creates space for various local agri-food initiatives (Roos et al., 2007), and this would offer an opportunity and a potential for transformation and movement.

The farmer-consumer interaction is considered being a logical movement to enhance production and marketing of quality product of pesticide-free vegetable production. The farmer-consumer interaction was designed through a series of interconnected activities, such as studies on consumers' behavior and preferences on vegetable consumption, establishing Saturday community market for pesticide-free vegetable products, facilitating farmer-consumer meeting to provide platform for both parties to interact, exchange, and learn from each others.

The weekend community market was set up on 21 February 2004 offering social space for farmer groups who were producing pesticide-free and organic agri-food products to sell their products. Within one year, in February 2005, the farmer from Ban Ping Noi was able to sign contract with Carrefour supermarket in Chiang Mai to make daily delivery of pesticide-free vegetables. In October 2005, the farmers groups at the weekend market decided to open Wednesday market when the demand had increased and the farm supplies of vegetables had also been improved. There were 13 farmer groups from 8 districts within Chiang Mai province bringing their pesticide-free vegetables to market.

The farmer-consumer interaction where the farmer-producer is able to meet and interact directly with consumers has shown to have positive impact on performance of Ban Ping Noi farmer by increasing crop diversity to meet consumers' needs.

Currently, the operation of Wednesday and Saturday community markets has reached the steady stage at which a particular type of consumers (majority are governmental employees) has grown accustomed to the farmers and their products. The Saturday market has become a popular place for social gathering not only between consumers from the same institutions, but also meeting new friends. The participating farmer groups are seemingly satisfied and contented with the marketing facilities from the two-day sale per week, and would not seek other alternative market. The gross income averages US\$ 400 per week which is moderately high by Thai standard.

The direct interaction with consumers as observed in the case study has enhanced farmers' capability to improve their farming structure, design and performance. Farmer is encouraged to incorporate more diverse species in the farming system design. This is one key resultant impact from farmer-consumer interaction, and is the important learning process for the converting farmers to adapt to change. The perception of values in agri-food system which is dominated by process and quality needs to be reassessed among farmer producers so that to retain the ethical relations between farmers and consumers in the community marketing system.

Searching for sustainable markets and chains

The Ban Ping Noi farmer had made an effort to market his quality vegetable products. The early attempt to deliver pesticide-free vegetables to health food retailers, food stalls and restaurants were not successful, either the supply was uncertain or high specificity on product quality. The Wednesday and Saturday market has offered the farmer opportunities to meet a number of collectors and large-scale retailers, but most also require relative large shipment of vegetables which are not easily organized by the farmer. The negotiation with the Carrefour supermarket in Chiang Mai had resulted in a contract arrangement with daily delivery of pesticide-free vegetables including common as well as local species since February 2005. The quality products are not certified, but the agreement is purely based on trust, and the farmer's trustworthiness.

A number of governmental agencies have approached the farmer groups to sell their products at the sites to provide easy access to the quality products on weekly basis. For instance, the Provincial Public Health Office and the Faculty of Dentistry have offered space for farmers. Not many farmer groups are enthusiastic about the offer, as the sale volume is not economically attractive. But the Ban Ping Noi farmer accepts the offer to establish good relationship. To date the farmer has made partnership with various institutions for marketing quality vegetable products as shown in Figure 2.

The new emergence of community markets organized by governmental agencies and NGOs specifically for the distribution of pesticide-free and organic agri-food products is still less organized supply chains. The key function is to facilitate easy access to quality products to consumers, and to promote farmer-consumer interaction. In the MCC community market, since its inception in February 2004, is currently managed by farmers groups who elect their own management committee, to oversee the member-sellers follow the rules and code of conduct. Recently with increasing consumer visits to the Wednesday and Saturday markets, a few cases of misconduct and disputes were observed where non-pesticide-free products were being displayed in the market, and there were

“quiet” complains and doubts from consumers when the off-seasoned products, which were known to be from other places, were sold in the market.

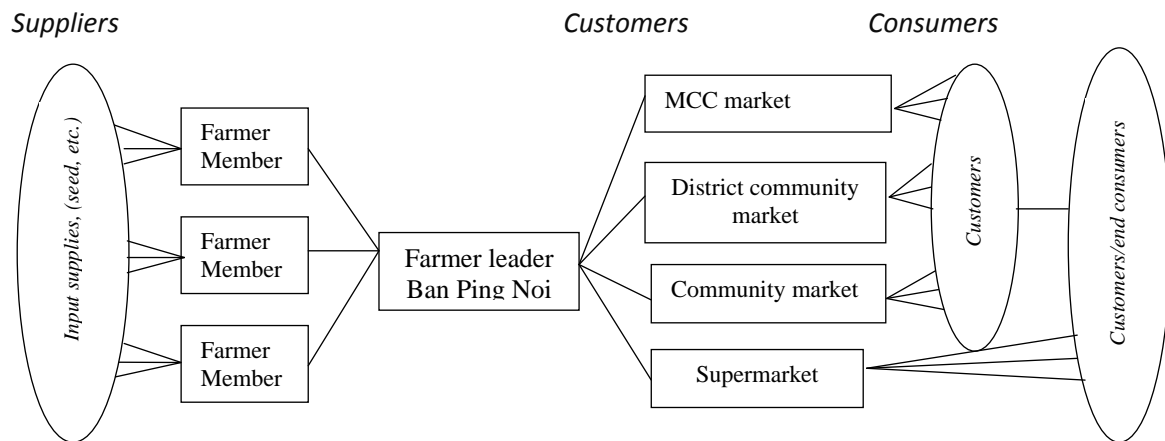


Figure 2. Supply chain structure of pesticide free vegetables in peri urban areas, Chiang Mai (Modified from Lamber and Cooper, 2000).

Six farmers of Ban Ping Noi who previously dis-adopted the system have decided to join the farmer to produce pesticide-free vegetables, but they prefer to distribute their products through the farmer, and will not personally handle the marketing. They are selective; each will specialize producing a few vegetables differently from each other, so that as a group, the products will be more diverse. The products will go to the Carrefour supermarket as well as the community markets. The early farmer-adopter has become producer-cum-distributor.

The farmer has distributed the products to the community markets, now four days per week through his daughter and in-law, and he himself handles the Carrefour market. The farmer pays 15 percent of the total sale to the Carrefour as commission fee, and 10 percent as tax. Farmer will receive weekly payment (with 25 percent deduction) from the Carrefour head office in Bangkok. On average, the weekly gross income in 2008 was US\$ 400. From the farmer's perspective, the gross income is only 75 percent of the total sale. But forming alliance with supermarket would secure market, and the farmer still retains the rights of price setting.

All supermarket chains in Chiang Mai are highly innovative and responsive to changing consumers' behavior, and have allocated spaces to accommodate clean and safe agri-food, including safe-use of chemicals, pesticide-free and organic products from local farmers and through supply chains, and some even have created their own brands. At present, not many distributors have received the certification, but all products are labeled with place of origins, where traceability is possible. Regulative barriers and periodic payment from the supermarkets are not conducive to farmers' entrance into business. However, the Ban Ping Noi farmer, and his group, is among a few who is the early entrant and has developed marketing alliance with the supermarket. With his personal belief and value systems, and his code of conduct in producing quality and safe products, he is able to coordinate farmer members to distribute the desired quality products. The Ban Ping Noi farmer has become an important actor in the supply chain.

The resultant impact of establishing marketing alliance with supermarket on Ban Ping Noi farmer has manifested in his overall improved farming performance and entrepreneurial management. The practice of grading and packaging has helped farmer's harvesting procedure by focusing on size, appearance, freshness, possible shelf life, and likelihood of marketable packages. Thus for production of quality products under diverse and integrated farming system design, productivity in terms of vegetable yield per unit area is not of great concern.

The district local government has planned to launch community market specifically for pesticide-free and organic products to provide market access and entry for farmers in the district. The Ban Ping Noi farmer sees the new district market, which is about 30 minutes from the village, as an alternative market outlet to the supermarket in the city.

Building farm resilience

The sustainability is not an enhanced capacity to adapt in the face of changes, but must also cope with unexpected events (Milestad and Darnhofer, 2003). A system's sustainability depends on the ability of ecological and socio-economic systems to cope with changes in both external and internal conditions and implies the capacity to create, test and maintain this adaptive capability (Holling, 2001; Pretty, 1997;). This is based on the concept of sustainable agriculture. Therefore resilience is a prerequisite for sustainability. The farmer in Ban Ping Noi has attempted to develop towards farm resilience. The farmer so far has developed polyculture of vegetables on 4 rai (0.6 ha) farm. The system is dynamic and evolving, and currently contributing significantly to enhance household livelihoods in several ways, such as

- it generates gross annual income about Baht 670,000 (US\$20,000) from the sale at the Carrefour supermarket.
- it provides full time employment for young daughter and in-law as retailer for pesticide-free agri-food products in community markets in the city.
- it helps smallholder farmers in the village distribute their vegetable products by establishing horizontal alliance between the farmer and his members
- it has become a learning center for the locals, and also a project site for governmental initiatives. For instance the Bureau of National Agricultural and Food Standards is currently collaborating with farmers to develop internal control system for Good Agricultural Practices (GAP) standards

Farmer is planning to advance his farming structure into organics with integrated farming systems, gradually building up harmonious relationship between farmland, vegetables, and livestock. To be self reliance on plant nutrient, farmer begins to raise local breed poultry and duck under free range in the longan orchard, and raises sow in the pitch where the pitch floor is covered with rice husk, soil and, and microbial plant extracts. The microbial plant extracts will reduce animal odour. Farmer's main objective of raising sow is to be self-reliance in organic fertilizers and to produce own piglets. The piglets will go through 4 months of fattening. The income from the fattening pigs is used to operate the farm, such as supporting labour cost. Farmer has selected local breed poultry because of its special culinary feature in traditional recipes, which is always in demand in local market.

The farmer has undergone changes from pesticide-free vegetable production system to gradually moving towards organics, while maintaining agro-ecological functions and structures. The farmer has built in agro-biodiversity into his integrated organic farm, allowing the system to absorb unforeseen shocks and disturbances. The farmer is capable of self-organizing and networking with potential partners, including trading partners, and governmental institutions and university. He also shows ability to build the capacity for learning and adaptation, through own experimentation on production technology and marketing initiatives, and interaction with research institutions and university for advanced knowledge. The observation shows that the farmer possesses certain characteristics that are capable of building farm resilience for sustainability (Folke et al., 1998).

Conclusions

The transforming agri-food systems in the peri-urban area would resemble the structured food system as described by McCullough et al. (2008) which is still characterized by traditional actors but with more rules and regulations applied to market places and market infrastructure. In the pesticide-

free vegetable system, the chains are organized where farmer/distributor as intermediary between farmer members and large scale retailer. The shorter chains would help speed up the supply of fresh and perishable vegetable products to consumers. The Ban Ping Noi farmer, who presently also takes the role of distributor, has formed marketing alliance with the Carrefour supermarket, and coordinated and consolidated the supply of diverse species of pesticide-free vegetables in such a way that helps reduce transactional cost.

The FFS learning approach is effective in farmer capacity building. The process enable farmers to consolidate experiential learning into new knowledge and translate into adaptive practices. However the process by itself would not be able to influence farmers' attitudes to change their world view. By following the growth and development of one adopted farmer in Ban Ping Noi throughout the years, it is evident that the shift from conventional to alternative pesticide free vegetable system requires revolutionary thinking. The change is strongly best on individual willingness to change, supported by social learning and interaction with external resource problems. The transformation is also brought to about by the development a network of relations at horizontal level, creating a spcae for collective leraning and action. This is well illustrated in various linkages such as producer-consumer interaction in the farmer market, farmer production and marketing network, farmer-external agency collaboration and etc. Collectively the various forms of horizontal networks help improve the growth and development of different farmer groups engaging in pesticide free vegetable or organic vegetable production and consumption. However, the network of relations requires coordination mechanism to facilitate the continuity of learning and adaptability leading to individual and community resilience.

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