CHAPTER 4

PERI-URBAN FARMING SYSTEM OF THE CHIANG MAI VALLEY

4.1 Characterization of peri-urban area

San Sai sub-district, Saraphi district located about 23 km in the South of Chiang Mai province. Topography of San Sai is a flat plain area in the east of Ping river plain, covering 9,512.50 rai(or 15.22 sq.km.). Ninety four percent of the total area accounting for 6,683 rai was agricultural land and 425 rai was residential area.

San Sai sub-district is 13 km far from Saraphi Administration Office comprised 12 villages as follows;

Village No.1 (Mu 1)	Ban San Sai Lam Chang
Village No.2 (Mu 2)	Ban Paa Sa
Village No.3 (Mu 3)	Ban Tah Song Kwae
Village No.4 (Mu 4)	Ban Sri Don Chai
Village No.5 (Mu 5)	Ban Tah Ma Kham
Village No.6 (Mu 6)	Ban Nong Ban
Village No.7 (Mu 7)	Ban Ping Luang
Village No.8 (Mu 8)	Ban Ping Noi
Village No.9 (Mu 9)	Ban Pak Klong
Village No.10 (Mu 10)	Ban San Sai Ma Haa Wong
Village No.11 (Mu 11)	Ban Long Poo Mhon
Village No.12 (Mu 12)	Ban Ton Phung

San-Sai sub-district is bounded on the north by Khuo Mung sub-district, Saraphi district, Chiang Mai and on the south by Pra Tu Pa sub-district, Muang district, Lamphun province and Nong Tong sub-district, Hang Dong district, Chiang Mai. Ta Kwang sub-district, Saraphi district, Chiang Mai and Khun Kong sub-district, Hang Dong district, Chiang Mai are the neighboring sub-districts in the east and the west. respectively (Figure 4.1).

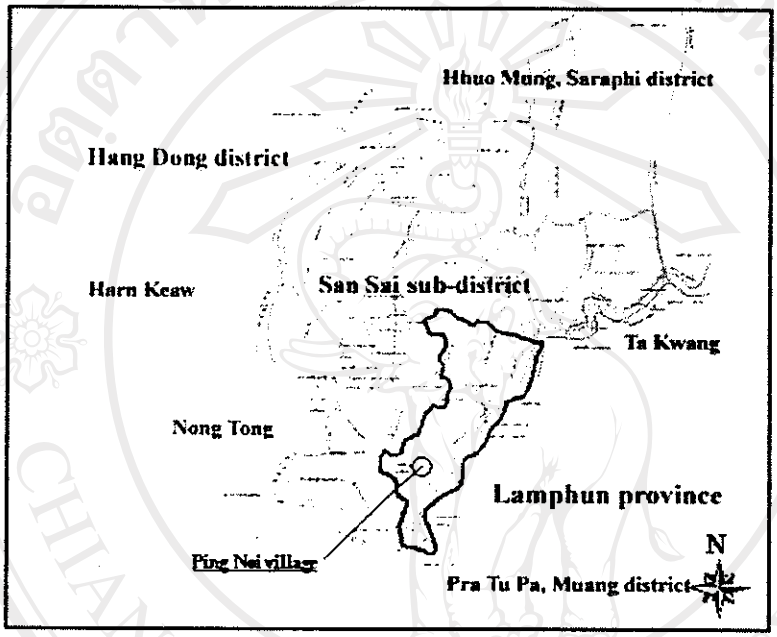

Figure 4.1 The location of Ban Ping Noi, San Sai sub-district, Saraphi district, Chiang Mai

Source: Adapted from map of irrigation canals in San Sai sub-district, Tambon Administrative Organization, 2003.

Ping noi is one of 12 villages in the San Sai sub-district, located in the southeast. The total area of land in Ban Ping Noi extends is 955 rai, of which 46 rai are residential areas. 909 rai are cultivated land, 5 rai are fishponds and 1 rai remains for public areas. While the residential land distributed in the Southeast of village, most of the fields are in the Northwest (Saraphi District Agricultural Extension Office, 2002).

4.1.1 Climatic condition

The monthly maximum and minimum temperatures and rainfall in year 2003 are giving in Figure 4.2. The seasons could be described as follows:

- The hot season from March to April had maximum temperature of 35.8 °C with minimum temperature around 19.3 °C. The rainfall ranged from 60.5 to 105.5 mm.
- The rainy season started from May to October with the maximum and minimum temperatures of 22.6 °C and 33.8 °C, respectively. The rainfall in this season varied from 41 to 207 mm.
- The cold season from November to February had minimum and maximum temperatures of 15.9 and 31.9 °C. A slight rain of 74.5 mm was recorded in November, and less probability of raining throughout the rest of the months.

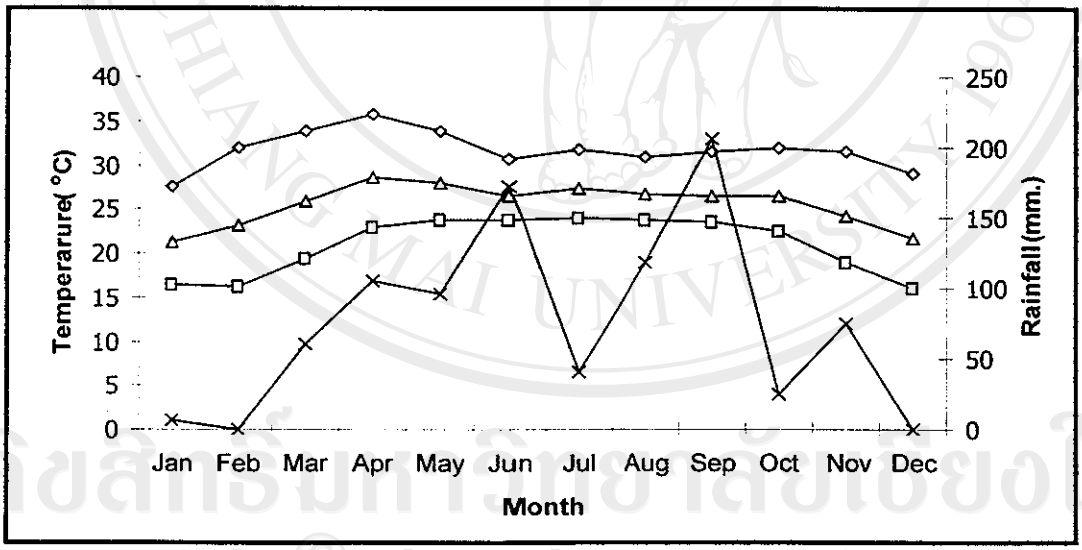

Figure 4.2 Climates of Saraphi District, Chiang Mai Province in year 2003

Remark: Amount of rainfall gathered from the District Administration Office in year 2004. Temperature data was Chiang Mai city, gathered from Northern Meteorological Center, Chiang Mai.

4.1.2 Soil characteristics

Soil in Saraphi district is sandy loam that was suitable for cultivation like as longan orchard, chili, shallot, garlic and the other vegetables. Soil types were combined with many kinds of soil group as follow (Saraphi District Agricultural Extension Office, 2002).

1. Alluvial Complex (AC). Normally found along the big river and stream. combined with Chiang Mai soil series (Cm), Pimaai soil series (Pm) and Kanlasin soil series (Km). This soil group was mainly used for rice cultivation in rainy season and vegetation in dry season. In rainy season, some part was flooded. Topsoil was sandy loam but bottom soil was loam sand complex (Ls) The properties of this group were good drainage, pH value ranged from 5.5 to 6.5 and the depth is over 1.50 meters.

2. SA. Complex. This soil group occurred along the earthen dyke (Natural river levee). Soil characteristic is medium texture. Almost topsoil was sandy loam having dark brown or dark brown gray color. Bottom soil was loam or sandy clay loam with brown or brown gray color. Normally used for residential area, and the rest for paddy field, orchards; longan, mango etc, cropping and vegetation. This group had a good drainage.

3. Ta muang Complex (TM). This soil generated from the deposition of sediments. normally found in the flood plain area and the natural river levee along the river. Topsoil is sandy loam with brown gray color. Bottom soil is loam or sandy clay loam. pH value of this soil type is 6.5 – 7.0. Almost land use types are residential area combined with paddy field, orchards and cropping. This group is also good drainage but different from SA complex, because having much more sand proportion. Depth of soil is over 1.50 meters.

4. Pi Maai Complex (Pm). This soil type was similar to Tm complex that generated from the deposit of sediments around flood plain area. Normally found in alluvial plain basin next to the natural river levee. Soil texture is clay loam or clay. Topsoil is dark gray until black. Properties of this group are good absorbance and drainage, flooding in rainy season and suitable for some kinds of crop and vegetable.

5. Asc-P. Alluvial soils Poor tey drain. This soil type combined between Pm complex and Hd (Hand dong) complex. Topsoil was clay loam or clay then continues with sandy loam or sand and the bottom soil is clay from the accumulation since above. This group has a good drainage can occurred in anywhere which are flood plain. pH value for this type is 5.5 – 7.5 that suitable for paddy filed.

6. Hd. Hang Dong Complex. Normally occurred around semi-recent terrace, which is the flood plain. Topsoil is silty clay with dark gray or black. Bottom soil is clay loam with gray or light brown gray. pH value of soil is 6.0 – 8.0 with a good absorbance and drainage that suitable for paddy field and shifting cultivation.

7. Ms. Mae Sai complex. This group occurred around the semi-recent terrace but upper than the soil in Hd class. Soil texture is silty clay with light brownish clay on the topsoil continues with clay loam and clay in the bottom soil. Color of soil is change by soil depth. The changing started from dark yellow browns, brown and yellowish brown in the bottom. This group was good absorbance and drainage, and was used for paddy field and cash crop cultivation. But the farmers usually should to improve their soils because of the problem from water lacking.

4.1.3 River and irrigation systems

San Sai sub-district was serviced by the Mae Ping Kow Irrigation Project, which was one of the oldest irrigation project commissioned by the Royal Irrigation Department (RID). The project served the cultivated land through the irrigation canals separated from Mae Ping river. There are totally 10 canals in San Sai but only 4 canals namely Muang chao maha wong, Muang rong sier ten, Muang siey nam and Muang chao yong pass through Ping Noi village as shown in figure 4.3. Therefore the area was endowed with favorable irrigation facility.

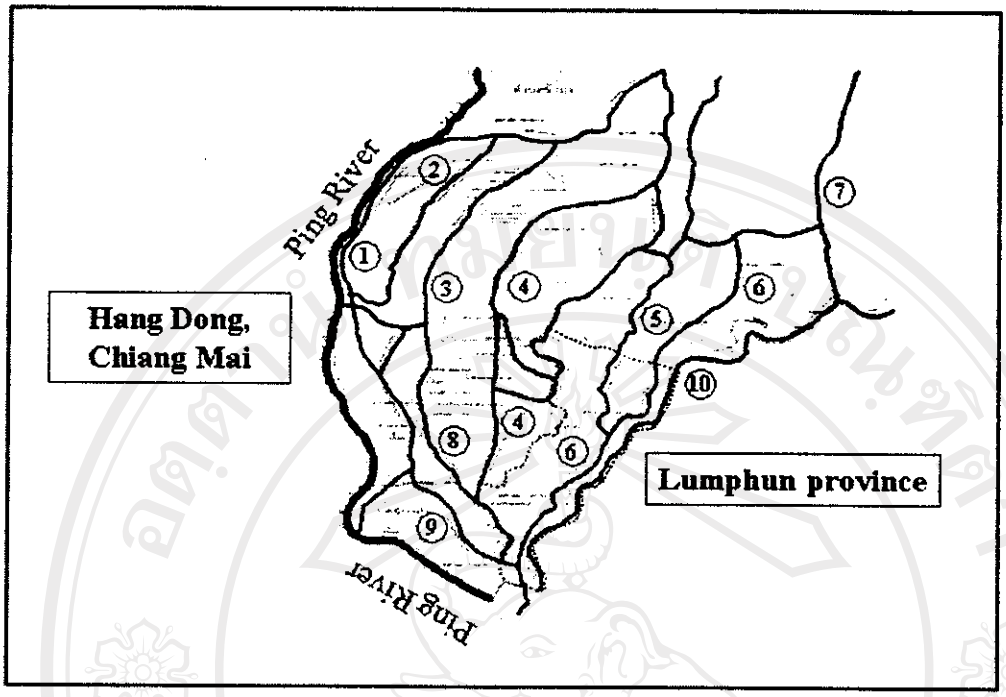

Figure 4.3 The irrigation canal distributed in San Sai sub-district

Source: Adapted from map of irrigation canals in San Sai sub-district, Tambon Administrative Organization, 2003.

No. 1	represent to	Pae lai muang luang
No. 2		Pae lai muang klang
No. 3		Pae lai muang hang
No. 4		Muang chao maha wong
No. 5		Muang rong sier ten
No. 6		Muang siey nam
No. 7		Muang paya kham
No. 8		Muang tung pu chiang
No. 9		Muang pae lai ton prai
No. 10		Muang chao yong

4.2 Characterization of peri-urban vegetable farmers

A field survey was conducted during the 2003 among farmers engaged in vegetable production in Ban Ping Noi village. A total of 13 farmers were interviewed among which 10 were willing to engage in pesticide-free vegetables.

4.2.1 Socio-economic characteristics

All respondents. both of pesticide-free vegetable group and conventional farmers, had only primary education at least in grade 4. Only 3 farmers (21.4%) graduated in grade 6. The household members were 3 – 6 persons per household, of which only 1 or 2 labours engaging in the fieldwork. Most farmers were members of organization or associations and related at least 2 groups in each household. The samples of organizations farmer involved were Agricultural Cooperatives, Bank for Agriculture and Agricultural Cooperatives, production groups, saving group, etc.

4.2.2 Demography

In year 2003, San Sai sub-district had 1,849 households with a total of 5,694 populations, 2,740 were males and 2,954 were females. The population density was 374 persons per square kilometer. Population growth rate from 2002 - 2003 accounted for 1.51percent decreased from year 2002 – 2003 was 4.36%.

The population of Ban Ping Noi, was 639 accounted for 11.2% of San Sai population. The total number of household was 209 (Saraphi District Administration Office, 2002).

4.2.3 Occupational structure

Majority of population in San Sai sub-district worked in agricultural sector (57 percent). However, these groups also worked off-farm to generate household income. Only 22 percent worked as waged labourers either as farm or non-farm workers. Only 6 percent was vendors and about one percent engaged in small and medium business enterprises. Other non-accountable was about 14 percent.

Table 4.1 The population's structure of San Sai sub-district in year 2001

	Male	Female	Total
Infancy (infant – 6 yrs.)	162	205	367
Childhood (7-12 yrs.)	319	331	650
Youth (13 – 17 yrs.)	192	190	382
Adult (18 – 60 yrs.)	1,650	1,825	3,475
Over 60 yrs.	405	414	819
Total	2,738	2,955	5,693

Source: Saraphi District Administration Office, 2002

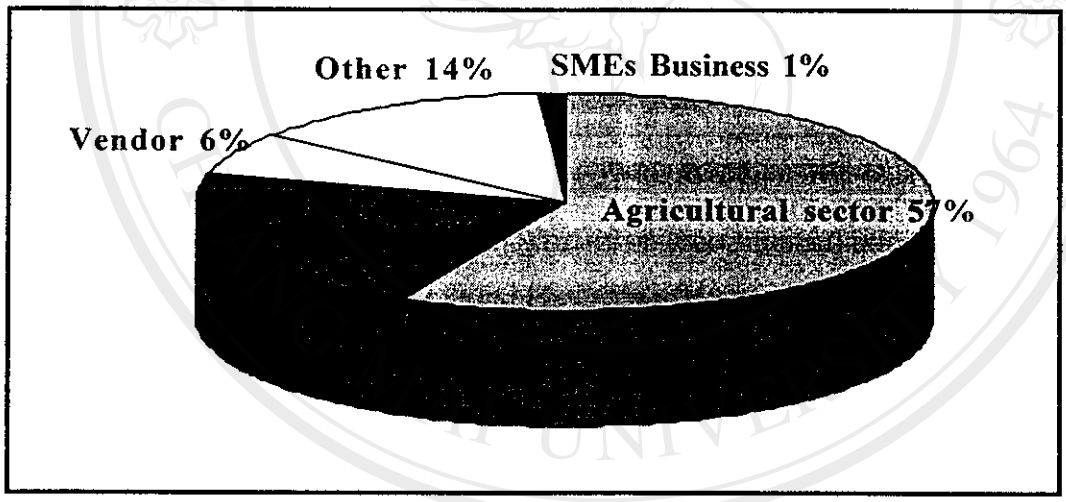

Figure 4.4 Occupational structure in San Sai sub-district in year 2003

Source: San Sai Tambon Administration Office, 2003.

4.2.4 Household income

The report of Saraphi District Administration Office (2003) stated that the average annual household income from all sources in Ban Ping Noi was 23,864 baht/year whilst lower than the average from the samplings was 138,846 baht/year. More than 75% of income relied on vegetable and longan production, a few parts was

from employment especially on on-farm wages. The investment in farm machinery offered opportunities for gaining extra income in both on-farm and off-farm employment. The off-farm income of most respondents came from vending.

4.2.5 Land tenure system

All farmers owned land from 1 rai to 13.5 rai with an average farm size of 5 rai. The owned land often utilized for longan orchard. Therefore, the farmers needed the extra holding for vegetable production. The rental fee was about 700 – 1,000 baht/rai/year.

4.2.6 Credit system

All farmers borrowed money for farming activities. The Agricultural Cooperatives and Bank for Agriculture and Agricultural Cooperatives were the important sources of credit. The other sources of credit were from formal and non-formal groups like as production groups (longan, garlic, pesticide-free vegetable, integrated farming, chicken, etc.), saving group in the village and village fund.

4.2.7 Source of technical information

The farmers obtained most of information from government officers in District Agricultural Extension Office. New verieties and chemicals sometimes introduced by the companies. Friends and relatives were also important source of agriculture information.

4.3 Vegetable production system in peri-urban area

4.3.1 Land use transformation

The traditional cropping systems in this area were rice-garlic-vegetables, and rice-soybean. When the demand of longan fruit was high, farmers started to replace garlic and soybean with longan. Vegetables were still important cash crop and were incorporated in longan orchard when the trees were still small. The thin canopies permitted the growth of short seasoned vegetables less affected by shading, while long maturing garlic was less suitable as intercrop with longan.

The longan had to be planted on the raised beds, as the area was flood prone, suffering annual flood for over one month during September to October. The Crop Diversification Program as promoted by the DOAE during 1995 to replace rice cultivation in the less favorable areas had encouraged farmers to transform their rice lands into longan orchards. Farmer received certain amount of free tree seedling as the incentive for land use transformation. Today there is almost no rice cultivation in Tambon Sansai.

Within Tambon Sansai, there were only four villages, Mu 1, 7, 8, and 10 growing vegetables almost throughout the year, with Mu 8 or Ban Ping Noi was the main producer where vegetables were planted on the open fields, and as an intercrop in longan orchards.

4.3.2 Cropping system and technologies changes

Ban Ping Noi was well known for its Pak Choi production. The species, being short seasoned, could be harvested in 32 days and harvesting lasted for 7 days. So the farmers would broadcast seed 5 days after the removal of the preceding crop. This would enable farmers to grow Pak Choi 5 to 6 cycles per year.

Other major vegetable species included chilli pepper (*Capsicum frutescens*) and eggplant (*Solanum melongena*). Both were long maturing, so farmers would intercrop Pak Choi or Chinese parsley (*Coriandrum sativum*) once during the early stage of growth. Chinese cabbage (heart-shaped) was one of economic crops in the winter. Table 4.2 displays cropping system in one year of farmers in Ban Ping Noi. The optimal vegetable growing season in Ban Ping Noi would extend from October to March. During March Farmers would be busy with harvesting of chili pepper. The hot dry season in April and May would not favor the production of vegetables, and farmers would begin to work on their longan orchards.

Table 4.2 Cropping systems of farmers in Ban Ping Noi

Variety	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pak Choi	■	■	■	■	■	■	■	■	■	■	■	■
Chinese cabbage	■									■	■	■
Chili	■	■	■	■						■	■	■
Eggplant	■	■	■	■	■						■	■
Garlic	■	■									■	■
Chinese parsley	■	■	■	■	■							

Source: Survey, 2003.

The systems were less diverse. In fact farmers had tried many species, such as cucumber (*Cucumis sativus*), cabbage (*Brassica* sp.), etc. but crops were not successful. Soil analysis by the private trading firm showed that the soil was boron deficient. So the farmers had to apply boron for the cultivation of these crops. Chemical fertilizers with added boron were not readily available in the market; farmers thus abandoned the cultivation of vegetables that were sensitive to boron deficiency.

All vegetable growers in Ban Ping Noi were not very keen as trading. The choice of vegetable species was entirely determined by the traders who came regularly to purchase the vegetable products on site. Since the traders had the contract with the Correction Department to supply vegetables, such as Pak Choi, to jailhouse at Mae Hong Son province, farmers had to grow Pak Choi in large areas collectively to meet the demand.

Under such circumstance where farmers depended solely on local and external trader for distribution, and did not develop marketing skills, as a consequence, vegetable diversity was very limited, thus making the production more vulnerable.

4.3.3 Incidence of pests and diseases

Flea beetles damaged on Cruciferous vegetables appeared to be the farmers' main concern at the time of the study. The critical period of vegetable was in the second week after transplanting. If flea beetles damage was observed on vegetables, pesticide are usually applied for pest control. The pests recovery period was 7 to 8 days, after that immediate spraying was required. At low pest frequency spraying twice per months was sufficient, at high frequency it was once per week.

Farmer observed that pest incidence during rainy season was lower than during the dry season. Floods led to decrease in pests, because most pests were soil living, after floods insect larvae emerged again and pest incidence increased. Farmers further observed that pests retreat in the soil during the day and were most active in late afternoon. This was therefore considered to be the best time for spraying.

Apart from regularly pests and diseases farmers encountered, vegetables also damaged from their inappropriate management such as over fertilizing and watering. Other pests and diseases observed during the time of study are shown in Table 4.3 and 4.4.

Table 4.3 Common pests observed in vegetable plots during the time of study

Common name	Scientific name	Vegetables
Aphid	*Aphis gossypii*	Pak Choi
American bollworm	*Helicoverpa armigera*	Sweet corn
Asian corn borer	*Ostrinia furnacalis*	Sweet corn
Beet armyworm	*Spodoptera exiqua*	Chinese cabbage
Cabbage looper	*Trichoplussia ni*	Chinese cabbage
Cotton leaf hopper	*Amrasca biguttula*	Sweet corn
Cricket	*Acheta testacea* Walker	Pak Choi
Diamond black moth	*Plutella xylostella*	Chinese cabbage
Flea beetles	*Phyllotrata chontacina, P. sinuata*	Pak Choi, Chinese cabbage, Chinese kale, Hong Te, *Raphanus* sp.
Fruit boring caterpillar	*Leucinodes orbonalis, Conogethes punctiferalis*	Egg plant, brenjal
Longan stink bug	*Tessaratoma papillsa*	Longan
Oriental fruit fly	*Bactrocera dorsalis*	Longan
Pea pod borer	*Etiella zincknella*	Yard long bean
White butterfly	*Catopsilia crocale crocale* Cramer, *Catopsilia pomoma ponoma* F., *Catopsilia pyranthe pyranthe* L.	Chinese cabbage, Pak Choi
Yellow tea thrip	*Scirtothrips dorsalis*	Chili, water spinach

Source: Farmer interview, 2003.

Table 4.4 Vegetable diseases observed in field during the time of study

Diseases	Type of vegetable	Caused by
Alternaria diseases	Cauliflower, cabbage, Chinese cabbage, leaf mustard, and Chinese kale	*Alternaria* sp.
Bacterial soft rot	Cabbage, cauliflower, leaf mustard, Petchai, cucumber, and Pak Choi	*Ervinia* sp.
Bacterial vascular wilts	Brenjal, and eggplant	*Pseudomonas solanacearum*
Downy Mildew	Angel loofa	*Peronospora parasitica*
Leaf anthracnose	Chili	*Colletotrichum gloeosporioides, Colletotrichum circinans*
Leaf blight	Water spinach	*Xanthomonas compestris pv*
Seedling damping-off	Chinese kale, spinach, Hong Te, chili, brenjal, and eggplant	*Phytoptera* sp., *Pythium* sp., *Rhizoctonai* sp., and *Fusarium* sp.
White Rust	Water spinach	*Albugo ipomoea-aquaticae Sawada*

Source: Farmer interview, 2003.

4.3.4 Promotion of pesticide-vegetable production

There were several projects initiated by the Ministry of Agriculture and Cooperatives (MOAC), and some private organizations to produce and market chemical-free vegetables. The DOA was also offering assistance to farmers by providing insect-proof net-houses to grow vegetables without spraying. The use of IPM and bio-pesticides had much wider scope. Another novel approach that the DOA was planning involves the development of indigenous vegetables that already had

built-in resistance to most pests and diseases, as opposed to imported varieties of commercial vegetables that seed companies supplied. Most of these varieties that were completely alien to Thailand did not have genetic material from indigenous sources of resistant germplasm. Consequently, when they were grown in the country they could not be successfully produced unless large quantities of agro-chemicals were used. The use of the local gene pool in future breeding program of the private and public sectors was therefore worth exploring.

In 1988, MOAC had launched the project subsidized pesticide-free vegetables in several provines. Provincial Plant Protection Unit, Chiang Mai under the DOAE had distributed necessary inputs for pesticide-free production such as insect-proof net-house and biological control substances for instance neem extract, nematode, microorganisms for compost fertilizer, etc. to interested farmers. The project also participated in farmers' planning, advised on farmers' management particularly in pest management, and arranged markets for farmers. The pilot project was conducted at Mu 10, Ban Ta Wang Taan, San Pa Kwao sub-district, Saraphi district. Simultaneously with the initiative from government, the Alternative Agriculture Network was established as a national network of NGOs and farmer organizations to foster alternative agriculture activities in Thailand (Reunglertpanyakul, 2004). Under the promotion both from government sectors and NGO, the pesticide-free vegetable consumption had increased and the production also expended to other areas.

Pesticide-free vegetable production in Ban Ping Noi initiated in early 2001, when Ban Ping Noi was selected as the training site for conducting FFS in IPM by the DOAE. The program lasted almost three months, from 28 March to 20 June 2001. There were 25 farmers jointed the program. The course content emphasized agro-ecological principles of farming, the use of natural products for pest control, and roles of parasites and predators in pest population dynamics. In addition, there were several farmer-dialogues being made among farmers attending FFS from various sites. Farmers were met once weekly on the production site. The commodity chosen for the learning was cauliflower (*Brassica oleraceae* var. *botrytis*). The production system as

not successful, simply because the crop selected such as cauliflower was not well adapted in hot and humid environment during March to June.

4.4 Farmer organization

Pesticide-free vegetable farming group developed from the integrated farming group initiated in 1999 when the farmers had finished FFS training with 35 farmers participated. The group was established responded to the government policy to reduced the chemicals application in the fields, developed the pesticide-free vegetable production to be the main source of incomes and offered opportunity for the farmers who just transformed their rice land to orchards to get income while the fruit trees was in the young stage. The farmers combined into an informal group. Forming in-group contributed farmers to obtain a lot of assistances from the government, private sectors and NGO. Subsidy and low costs of inputs also contributed to the members. The director of Tambon Service and Technology Training Center plays the important role in connecting farmers to the outside.

4.5 Farmer typology

Farmer characterization in this study aimed to classify farmers according to their strategies adapted to their limitations. The hypothesis for this purpose was different factors in biophysical, socio-economics and farmers' attitude affected farmers' potential that the different limitations would lead to the different decision in each farmer.

Thirteen farmers were interview, of which ten farmers were the pesticide-free vegetable farmers and three were the conventional farmers. All farmers have their own land with longan orchards, which were the flood prone area in rainy season. Six of them have the young longan that can integrate vegetable production into the orchards for about 3 – 5 years. All of them had rented land at least 0.25 rai and maximum 5 rais for producing only vegetables. Their source of water was only from irrigation canal that serviced by the Mae Ping Kaw Irrigation Project. The number of household family was 3 – 6 people with 1 or 2 agricultural labour per household.

There were three cropping systems in this group that combined with Pak Choi all-year-round, Chili – Pak Choi – other short season vegetables mainly on leafy vegetables, and Eggplant – Pak Choi – other short season vegetables. Some vegetables were produced seasonally for instance hearted shape cabbage and cauliflower in the winter and coriander in the hot season. The cropping system started around October, after the annual flood. when long maturity plants such as chili or eggplant were first transplanted. Pak choi was broadcasted into the field in sole planting or in the planted when chili and eggplant plots. One to two crops of Pak Choi could be produced before the main crop was productive.

Annual income was at least 100,000 baht/year/household. Nine farmers had their main income from agricultural sector and five of them had the vegetable production to be the main source of income.

Farmer classification was divided into 3 groups according to their strategies and alternatives that shown in Table 4.5.

Farmers in A group aimed to maximum household productivity under the limitation land and labour. It was found that agricultural labour in this group was only 1 man labour that had the off-farm working like vendor or on-farm employment. Conventional farming system was suitable for this group that the production was not labour intensive, it needed only half day per day or just in the morning and evening. Hired labours were needed at transplanting and harvesting time.

Farmers in B group would like to reduce chemicals utilization in their field but they were not ensured on the pesticide-free marketing. The production was maintaining the conventional farming with less of chemicals and allocated some pieces of land for production of the pesticide-free vegetables. Only a few varieties were planted in large area that offered opportunity for distributed in both conventional and pesticide-free market. Almost farmers, accounting for 62%, were in this group.

There was only one farmer in C group. He completely changed his production into pesticide-free farming. His field combined with more than 12 variety of vegetables with succession planting. Some plots were left follow to help reduce pest

and disease incidence. This system was labour inetnsive, he indicated that 2 household labour were enough for the production of 2 rais. Hired labours were necessary sometimes for weeding or harvesting.

Table 4.5 Strategy and alternative of vegetable farmers in Ban Ping Noi

Farmer typology	Objective	Strategy and alternative	No. of Farmer
A	Maximum household labour productivity under the limitation of resources and labour	Conventional system was their alternative to reduce the labour utilization and offered opportunity for off-farm working	4
B	Maximum income per planted area and reducing chemicals utilization	Maintaining conventional farming but reduce in chemicals utilization and allocated some pieces of land for produce pesticide-free vegetable with less diverse, and planted in the large area for the distributed in both conventional and pesticide-free market	8
C	- Reducing chemicals utilization - Daily income for support household and on-farm expenditure	Pesticide-free vegetable production emphasized on the diversity to distribute the risk on production	1

Source: Survey, 2003.