CHAPTER IV

RESULTS: STUDY AREA AND RESPONDENTS' PROFILE

Before studying the awareness of the farmers on the harmful effects of pesticides in vegetables and flowers production; it is necessary to know the environmental condition of the study area. Therefore this chapter describes biophysical and socioeconomic factors and behaviors of the farmers in using pesticides. The term farmers in this chapter represents both the vegetables and flowers growers because almost all of the growers cultivate both crops in annual growing season and together used pesticides to control the pests and diseases in both crops.

4.1 Biophysical environment

4.1.1 Location and area

Field survey was conducted in Pyin Oo Lwin which is one of the resort towns located in the Shan highland, some 67 kilometers (42 miles) East of Mandalay and at an altitude of 1,070 meters (3,510 ft). Pyin Oo Lwin township covers about 763.74 square miles and has a population of 154,477 in 2010.

That township is famous for her producing vegetables and flowers and transport to other townships annually. Sweater knitting, flower and vegetable gardens, strawberry and pineapple orchards, coffee plantations and cow rearing are the main local businesses. The city is a resort town for visitors from Myanmar's major cities during the summer time and a popular stop for foreign tourists during the winter season. In addition, Pyin Oo Lwin is the centre of the country' principal flowers and

vegetables production (Source: Wikipedia, the free encyclopedia).

4.1.2 Climate

The study area has humid subtropical climate and annual maximum average temperature is about 23.8˚Cand minimum average temperature is about 13.39 ˚C. The month of May is the hottest month with the average temperature of 27.89˚C and January is the coolest month with an average temperature of 5.11˚C. The maximum and minimum temperature of the study area in 2009 is shown in Figure 4.1.

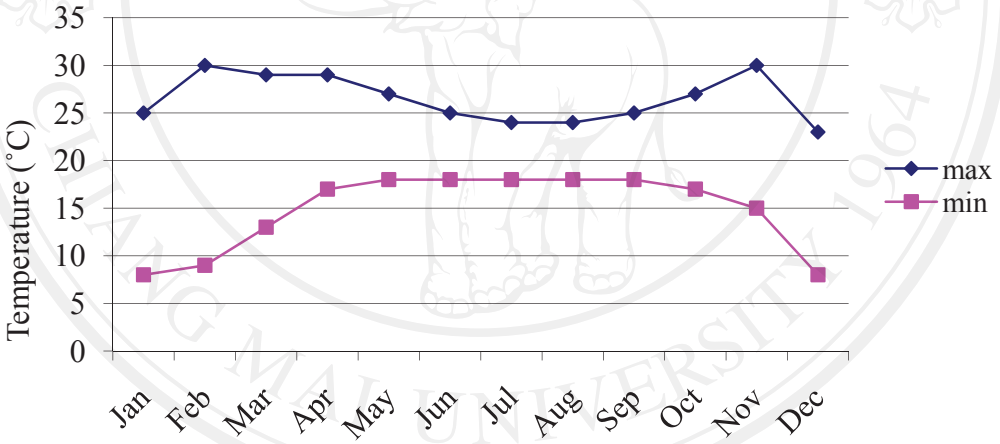

Figure 4.1 Monthly maximum and minimum temperature of the study area (2009).
Source: Township Agricultural Office, Pyin Oo Lwin(2009)

Total rainfall distribution is about 1548 mm in 2009(Figure 4.2). Average annual rainfall is 1,524 mm and average total rainy days are 90. Figure 4.2 also shown the rainy days of the study are in 2009. The highest rainfall occurs in August and the lowest rainfall is in January. According to the survey most of the farmers using pesticides more frequently in rainy season because rain splash the pesticide from the

crop. To prevent from the crop lost farmers used more pesticides without considering the harmful effects.

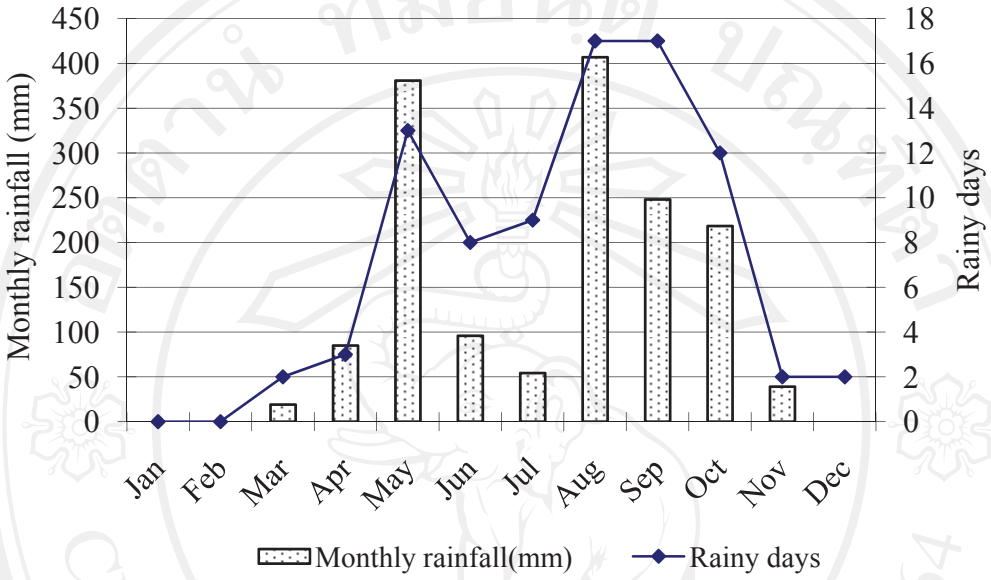

Figure 4.2 Distribution of rainfall (mm) and rainy days in the study area (2009).

Source: Township Agricultural Office, Pyin Oo Lwin, 2009.

4.1.3 Soil

The study area is not only a Plateau but also connected with dry region so we can found so many soil types. Depend on the weather the soil types found are red earths and yellow earths, peat soil, etc. The soil reaction is slightly acid to neutral with pH ranging from 6 to 7. The red earth is the typical soils for agriculture in Shan State. They are well drained, having good structure and easy to plough so they are very suitable for cultivation of seasonal and perennial crops. Figure 4.3shows the soil map of Mandalay division.

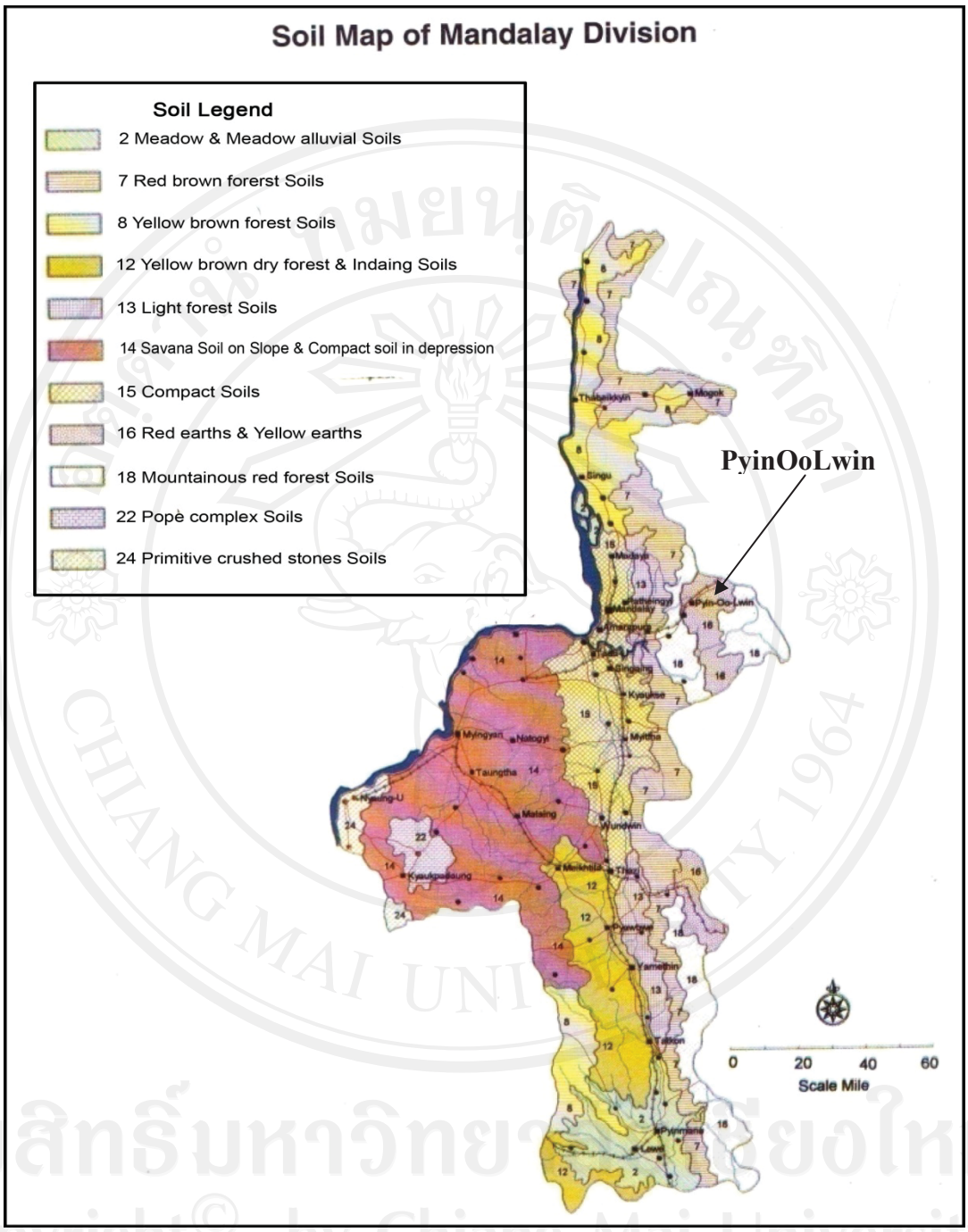

Figure 4.3 Soil map of Mandalay division.

Source: Soil Types and Characteristics of Myanmar, MOAI (2004)

4.2 General characteristics of the study area

4.2.1 Growing area of vegetables and flowers

In this study area farmers grow rice, wheat, maize, corn, vegetables and flowers. There are many kinds of vegetables but farmers mainly grow cabbage, tomato, cauliflower, mustard, kale, etc. Figure 4.4 shows the crops production areas and Table 4.1 shows the vegetables growing area of the study area. Total vegetables growing area is about 2172.8 ha.

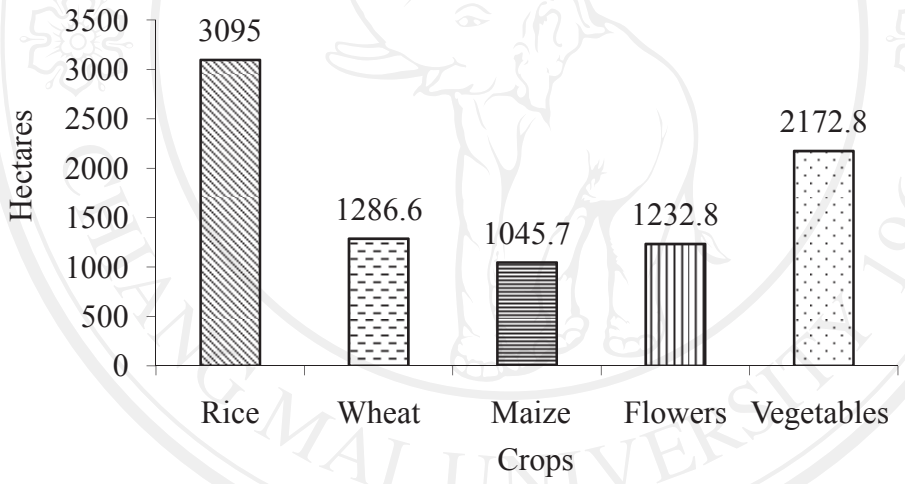

Figure 4.4 Crops production area in Pyin Oo Lwin (2009-2010).

Source: Township General Administration Office (2010)

The most widely grown flowers are chrysanthemum, aster and gladiolus. The total flower growing area is about 615.4 hectare in raining season and 617.4 hectare in winter season (Source: Township Agricultural Office, 2009).

Table 4.1 Production area of vegetable crops in Pyin Oo Lwin (2009-2010)

No.	Name of Vegetables	Sown area (ha)	Production (ton)
1	Cabbage	219.4	6,034.7
2	Cauliflower	115.8	796.9
3	Lettuce	18.2	93.6
4	Mustard	400.8	3,389.4
5	Tomato	708.5	19,598.5
6	Carrot	159.1	1,436.1
7	Yard long bean	62.7	165.4
8	Eggplant	18.2	135.2
9	Radish	167.2	840.7
10	Kale	85.8	550.8
11	Bean	91.9	145.1
12	Other vegetables	125.1	701.9
	Total	2172.8	33888.4

Source: Township Agricultural Office, Pyin Oo Lwin (2009)

4.2.2 Cropping systems

Farmers in the study area grow different kinds of vegetables and flowers one after one in year round. For example cabbage from January to April, chrysanthemum from May to October, mustard from October to December. Some farmers grow chrysanthemum from January to May, cabbage from June to September, and kale from October to February. Some farmers grow mustard from March to May,

cauliflower from May to July, tomato from July to October and chrysanthemum from October to March, etc. shown in Figure 4.5.

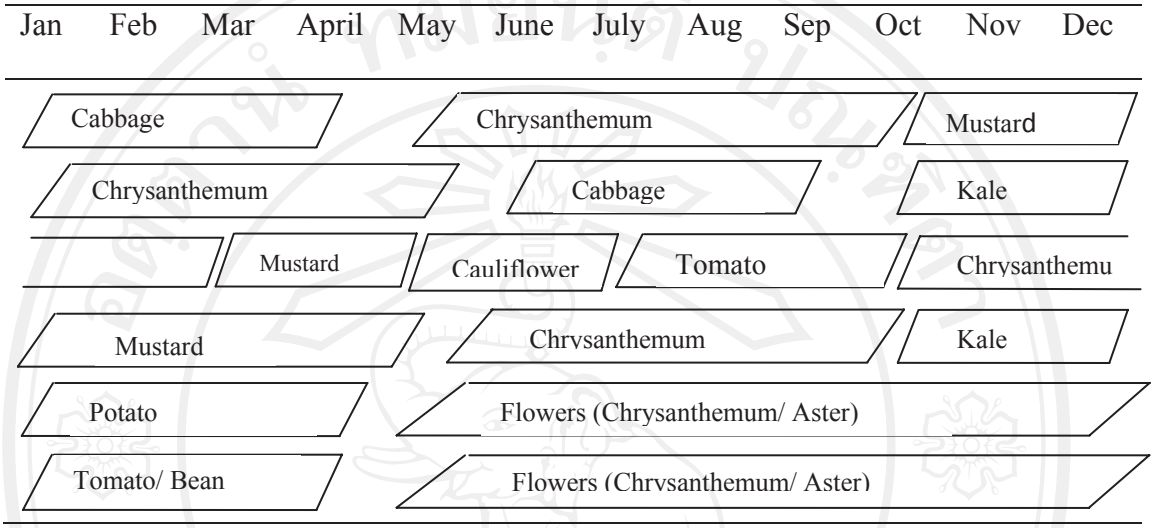

Figure 4.5 Cropping patterns in the study area.

Source: Survey data (2010)

However few farmers grow only flowers but different species all year round. Land preparation is practiced at least 2 times plowing and 2 times harrowing before planting the crops. A labor requirement is at peak at weeding and harvesting time and usually farmers share or hired labor from outside area and almost all of the farmers also use their family labor.

4.2.3 Current use of pesticides in the study area

The types of pesticides use by farmers included 15 insecticides, 13 fungicides and 3 herbicides. Farmers also used unregistered insecticides and fungicides imported from China. The study showed that, different pesticide formulation types used by farmers in the area most were insecticides (53 per cent), fungicides (36 per cent),

herbicides (2 per cent) and unregistered pesticides from China (9 per cent). The most commonly used active ingredients were the insecticides; cypermethrin, cartap, chlorpyrifos, abamectin, chlorpyrifos+cyper, and the fungicides; mancozeb, carbendazim, metalaxyl, sulfur (Cumulus) and herbicides; glyphosate and gramozome. Other active ingredients farmers used were listed in Table 4.2. Carbofuran, methomyl and monocrotophose insecticides are the only World Health organization (WHO) Class Ib (highly hazardous) recorded in use. Other classes such as II (moderately hazardous), III (slightly hazardous) or (unlikely to present acute hazard) types were also used in the study area.

Table 4.2 Current use of pesticides in the study area

	Insecticides			
No.	Active ingredient	Chemical group	WHO Hazard class	No.of farmers
1	Abamectin	Microbial 1 A	not listed	123
2	Cypermethrin	Pyrethroid	II	107
3	Chlorpyrifos	OPI	II	39
4	Cartap	Nereistoxin	II	29
5	Chlorpyrifos+Cyper	OPI+ Pyrethriod	II	23
6	Imidacloprid	Nitroguanidines	II	21
7	Acephate	OPI	III	12
8	Alpha cyper+ Chlorpyrifos	OPI+ Pyrethriod	II	12
9	Methomyl(Wanerny)	N-methyl Carbamate	Ib	7
10	Monocrotophose	OPI	Ib	5
11	Carbofuran	Carbamate	Ib	5

12	Profenofos	OPI	II	3
13	Endusalfan	OCI	II	3
14	Decis	Pyrethroid	II	2
15	Acetamiprid	Nitroguanidines	not listed	1
	Fungicides			
16	Mancozeb	Thiocarbamates	U	137
17	Metalaxyl	Xylylalanine	III	40
18	Sulfur(Kumulus)	Inorganic sulphur	O	26
19	Carbendazim	Benzimidazole	U	21
20	Azoxystrobin	Strobilurin	U	11
21	Thiophenate methyl(Topsin M)	Benzimidazole	U	9
22	Copper oxychloride	Inorganic copper	III	8
23	Copper hydroxide	Inorganic copper	III	7
24	Hexaconazole	Azole	U	7
25	Captan	Phthalimid	U	5
26	Propineb	Dithiocarbamate	U	3
27	Cholothalonil	Chloronitrile	U	3
28	Benomyl		U	2
	Herbicides			
29	Glyphosate	Glycine	U	7
30	Gramozome	Bipyridylium	II	7
31	2,4-D	Phenoxy acid	II	2

Source: Survey data (2010)

Note: Ib: highly hazardous, II: moderately hazardous, III: slightly hazardous

U: unlikely to be hazardous, O: nor hazardous

WHO (World Health Organization) classification (2004)

4.2.4 Major pests and diseases in the study area

Farmers in the study area identified insect pests (74 per cent) of respondents and diseases (26 per cent) as major constraints to vegetables and flowers cultivation. Chemical pest control was the dominant control strategy.

Table 4.3 Common pests and diseases in the study area

No.	Pests	No. of farmers	No.	Diseases	No. of farmers
1	Aphid	100	1	Downy mildew	60
2	Leaf miner	80	2	White rust(Puccinia)	60
3	Diamond back moth(DBM)	73	3	Powdery mildew	18
4	Thrips	51	4	Bacterial wilt	14
5	Grub	48	5	Soft rot	13
6	Tomato fruit worm	47	6	Bacterial leaf spot	9
7	Swarming catrtpillar	37	7	Stem rot	8
8	Semi-looper	23	8	Rust	8
9	Flea beetle	20	9	Leaf spot	6
10	Leaf eating caterpillar	18	10	Black leg	5
11	Cutworm	16	11	Onion purple blotch	2
12	Green leaf hopper	16	12	Early blight	2
13	Stem borer	13	13	Anthracnose	1
14	Bugs	10			
15	Mustard caterpillar	10			
16	Red spider mite	9			
17	Mustard sawfly	6			

Source: Survey data (2010)

Aphids, diamond back moth, grabs, tomato fruit worm and downy mildew were major problem in vegetables production and leaf miner, thrips and white rust

were major problem in flowers production. Table 4.3 shows the pests and diseases found in this study area.

4.3 General characteristics of the sampled respondents

4.3.1 Socioeconomic status

In order to conduct data analysis, information on the interviewed farmers was collected using open-ended questions. Table 4.4 shows the summarized socioeconomic status of the interviewed farmers.

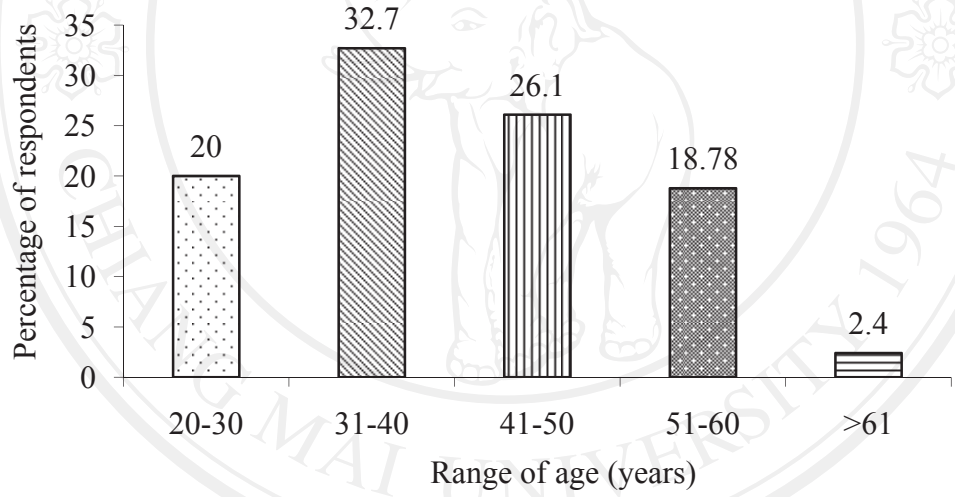

Figure 4.6 The percentage of age of the respondents in the study area (n =165).

According to the results from field survey, the average age of the household head was 40.53 years, the youngest was 20 years and the oldest was 76 years with a standard deviation of 10.72. In this study area 20 per cent of the respondents were the age of between 20-30 years, 32.7 per cent were 31-40 years, 26.1per cent were 41-50, 18.8 per cent were 51-60 years and 2.4 per cent was older than 61 years shown in Figure 4.6.

This study measured the awareness of the farmers and the target respondents were the head of the households who made decision for the farming activities. Therefore only 12.1 per cent of the households averaged were female headed households. Nevertheless, wives who have their husbands but they have achieved in farming and made decision to choose the varieties or agro- chemicals were also interviewed.

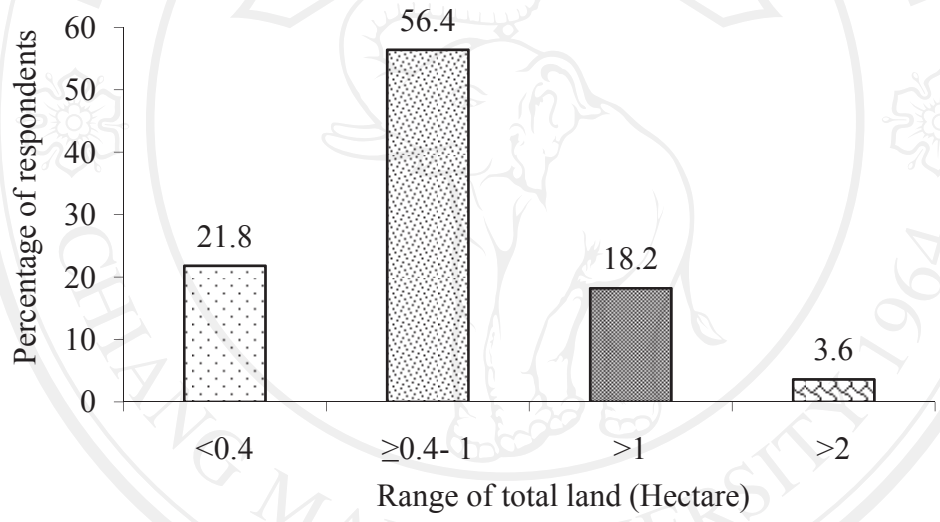

Figure 4.7 Farm distribution of sampled respondents per cent (n =165).

The total farm sized varied from 0.08 ha to 2.83 ha, with a mean of 2.00 and standard deviation of 0.49. Nearly 15.8 per cent of the farmers owned less than 0.4 ha and 56.4 per cent of the farmers possessed 0.4 to 1 hectare. Most of the farmers could be characterized as small scale farmers in the study area. About 18.2 per cent of the total respondents owned more than one hectare and only 3.6 per cent ran their flowers and vegetables production with more than 2 hectare shown in Figure 4.7.

The average numbers of years of education received by the farmers was 7.26 years, with a standard deviation of 3.06. Generally the education level of the farmers was low. 44 percent of the respondents were primary education. The best educated respondents were a collage graduate with 15 years of education, which account for 4.1per cent of the total respondents. Although some respondents who have no higher education but they might have good reasoning skills and awareness based on their working experience.

The average household size was 4.94 members (standard deviation 1.67). The most common household size was 4-6 members, which was 66.6 per cent of the total sampled households.

On average, the respondents had been engaged in vegetables and flowers production for 17.16 years (standard deviation 10.77) with a minimum of 2 years and maximum of 50 years. Most farmers had been farming for a number of years and had accumulated experiences in vegetables and flowers production.

Income level was assumed to influence the awareness of the farmers indirectly for instance the individuals with higher income can buy some facilities such as newspapers, TV, radio or telephone, etc, meaning that he/she might have more opportunities of being exposed to different media of information sources.

The family income (combination of farm income and off-farm income) was divided into three level; low (less than 4,000,000 Kyats), medium (equal or more than 4,000,000 – less than 8,000,000 Kyats) and high (equal or more than 8,000,000 Kyats) per year because some households have very high off-farm income but some do not have any. Most of the farmers (86.6 per cent) had low level income, 15.2 per

cent had medium and the rest (4.2 per cent) had high level income. Some households have very high off-farm income but some do not even have any.

Table 4.4 Summarized description of the selected variables

Variables	Mean (n =165)	Standard deviation
Age of HH head (Years)	40.53	10.73
Education of HH head(Years)	7.26	3.07
Number of family (Number)	4.94	1.68
Total land (Hectare)	2.00	0.68
Growing experience (Years)	17.16	10.78
Use of pesticides (Years)	12.04	8.13
No. of times for training(Times)	1.47	1.85
	% of respondents	
Extension visit	4%	
Loan access	16%	
Semi-commercial production	53%	
Commercial production	47%	
Sharing information about pesticides	77%	
Information access	86%	
Family income –		
Low (<4,000,000 Kyats/ Year)	80.6%	
Medium (≥4,000,000-<8,000,000 Kyats/ Year)	15.2%	
High (≥8,000,000 Kyats/ Year)	4.2%	

Source: Survey data (2010) Note: 1000 Kyats =1 US$

The factors of getting loans form government or non-government organizations was also used as a proxy in independent variables that influence on awareness index of the farmers. The farmers who get loans used to have a good relationship with the staff or technicians form the different organizations. They have much more opportunities to gain knowledge and information from the staff or technician. This study, only 16.4 per cent of the total respondents received loan form GOs, NGOs and local money lender. The rest of the people did not get loan from any sources.

About 52.7 per cent of the total farmers were as semi-commercial farmers and 47.3 per cent were commercial farmers. Semi commercial means the farmers who possess small area that can be able to support money only enough for their family. Commercial means farmers mainly grow vegetables and flowers for commercial production and their investment and income is higher than semi-commercial farmers. These farmers keeping pesticides for 2-3 years in their farm shed.

According to the survey, most of the farmers (77 per cent) sharing information about the harmful effects of pesticides with technicians or neighborhoods and accessed information (86 per cent) from sale promoters and technicians from private company for the utilization of pesticides and choose the suitable types of pesticides. The variables are shown in Table 4.4.

4.3.2 Exposure to information and knowledge status

4.3.2.1 Extension contact

The extension contact was considered to be very important in influencing the awareness index of the farmers. Some previous researchers also found that the

awareness of the farmers was significantly correlated to the extension education. The farmers with exposure to extension staff can have high level of agricultural knowledge and much more pesticides information too. But in Myanmar, extension education was found to be very weak process and the majority of farmers had very low level of agricultural knowledge especially they were still being unaware of undesirable side effects of modern agro-chemicals.

Although it was very simple and general to be considered that the respondent with extension contact can have high level of awareness, it may vary as we cannot know the orientation of the extension staff whether he or she was much more willing to encourage the farmers to use chemical fertilizers or organic ones and biological pest control or chemical control. It was also depending on the ways of information and technology delivery general assumption of positive relationship between the extension contact and awareness index of the farmers.

4.3.2.2 Training experience

The training experience appears as the most important factor which can upgrade the level of awareness of the people. The respondents may have experienced different types of trainings and only the agricultural training was selected in this case. About 60.6 percent of the farmers claimed that they had received training for using pesticides. However, there were 65 people (39.39 per cent) who had never attended training session. Only 25.45 per cent of the total farmers attended training only 1 time and 35.15 per cent had attended more than one time. Most of the training was conducted by private company especially agro-chemicals enterprises and they went to the farmers, advertised their product accompanied with agricultural technicians.

4.4 Pesticides used

When growing vegetables and flowers become important business, farmers started the required products subject to the market's demand. Thus chemicals started taking roles they had to be use in growing vegetables and flowers. The farmers began to use pesticides since 1960s and used more lately in order to increase the production amount and to control the standard quality of products as the market's demand. When growing flowers and vegetables offered more income to them, chemicals were also more important components in growing process as per the details presented in Figure 4.8.

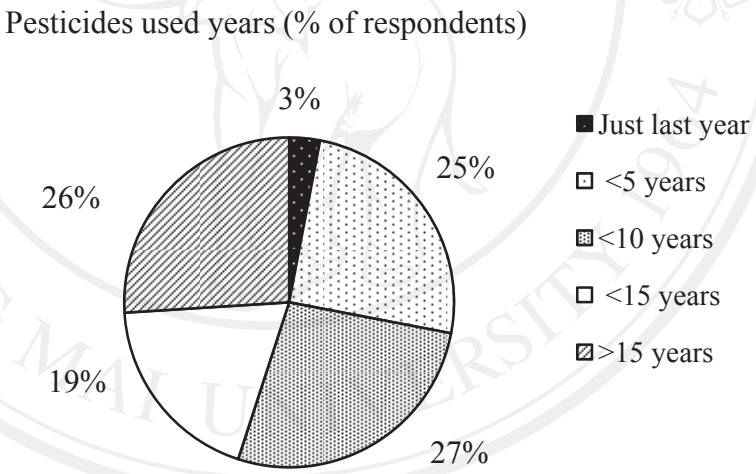

Figure 4.8 Years of using pesticides (% of respondents) (n =165).

According to Figure (4.8), we found that pesticides had been more used for 5-10 years (27 per cent), and for over 15 years (26 per cent).

4.4.1 Sources of information to use pesticides

The first group of total 29.2 per cent got information to use pesticides from other growers and the second largest group's used pesticides (26.9per cent) by own experience, and pesticides dealer (13.8 per cent) respectively. Only 10.3 per cent of the responses came from technicians, 5.8 per cent came from training experience and there is any information from extension workers (Table 4.5). Waichman*et al*. (2007) described that knowledge on pesticides usage was based mostly on the opinion of product retailers or on farmers' own experience. Thus, the information given by neighbors or store employees was perceived as enough to provide the necessary understanding for pesticides use.

Among these sources of technical information on pesticide use, the information from training experience and extension contact were assumed to be the best quality sources as the farmers can directly be exposed with the technicians and achieve the best detail information. In addition, dealer and sale promoter may also distribute good information on pesticide use in safe and effective use but it is not totally reliable as they can persuade the farmers to use more chemicals and their products by attractive advertisements. For example some companies advertise that their pesticide can control almost all the pests and diseases and the villagers also believe or sometimes misunderstand it and have the wrong perception. The information from other growers may not be judged as good source as they were indirect informers.

Table 4.5 Sources of information to use pesticides

No.	getting information from	% of respondents(n =165)
1	own experience	26.9
2	other growers	29.2
3	pesticide dealer	13.8
4	sale promoter	14.0
5	technicians	10.3
6	training experience	5.8
Total		100

Source: Survey data (2010)

4.4.2 Intensity of reliance on pesticides used

It can easily be known that it is almost a compulsory to use pesticides in farming. A question asking about possible loss without using pesticide was used to check the dependency of farmers on the pesticides and their fear on pest and diseases. The question was that how much the crop loss they expect if they don't use pesticides and most of the respondents were very afraid of growing crops without using pesticides. Among the total respondents 136 persons (82.42 per cent) said 60 % and above crop loss would be happened to them in bad season if pesticide did not use. 73 persons (44.24 per cent) said 60 %and above crop loss could be happened if pesticide was not applied in the year of normal pest attack.

4.4.3 Potentiality of pesticides used

Asking about the future intention to use was one of the important indicators showing that the dependency of farmers on the pesticides and they do not have a willingness to try to find the alternative ways of pest protection to reduce harmful

effects. The researcher used a question to know if they were willing to use more pesticides if they had enough money. Those who were of quite aware answered very logically that they would not use more even if they had enough money and they would use only necessary amount. The respondents with no or low awareness answered that they would use more if they had enough money. The respondents (15.2 per cent) answered if they had enough money they would use more pesticides. It was a dangerous situation as they were very fond of using and showing high dependency on pesticides. They don't think about the economic efficiency and side effects on their environment.

4.4.4 Use of pesticides with care

It is critically important for the producers and distributors to mention the clear instruction and necessary cautions in or on the pesticides containers. Myanmar Agriculture Service (Plant Protection Department) had already issued a law for that. Nevertheless various kinds of pesticides without any legalized trade mark and clear instructions were easily available in the local markets. Some chemicals which had already banned by the Ministry of Agriculture could even be found in the local market and they were illegally imported from Thailand and China. By the survey result, 60.1 per cent of the total respondents read the instructions before using the pesticides.

It is a good habit to reading the explanation, instructions and cautions for the specific pesticides before use. But some farmers did not read and just followed the way what their friends or neighborhood growers done. Some people read but could not understand the instructions. By the survey experience, majority of the farmers did not follow the instructions and mostly apply overdose in order to control pests and

disease infections effectively. What they understand was that using higher dosage than the instructed amount could be more effective but they were not much aware of the negative consequence of over dosage and they did not know the suitable types of pesticides for particular pest or disease and 92.12 per cent of the respondents said they knew. But it was not a reliable data as it was just a way of what they thought and the researcher could not apply the IPM knowledge test due to the time limit.

Farmers had their own strategy to deal with new pests and unsuccessful pest control. When a pesticide was not effective for a given pest, the product was replaced by a stronger product of high toxicity, disregarding whether the new product was appropriate for a given crop or not.

Another important problem was the lack of knowledge on distinguishing pest and diseases. According to the result of Khin Hnin Yu (2005), the majority of the farmers were using the insecticides and fungicides in opposite proportions. They were using less amount of fungicide than necessary while more amount insecticides than necessary.

4.5 Farmers' behaviors towards the use of pesticides

4.5.1 Reading the instructions

More than half of the farmers (60 per cent) read the instructions that included in the pesticides container. Even though most of the growers read the recommendations and instructions on pesticide containers some of them prefer to use either too large doses or unsuitable pesticides in order to guarantee the yield and quality of the vegetables and flowers grown by them. Among the respondents 28 per cent were rarely read and 11 per cent read them sometimes. Only one per cent was never read

the instruction before using the pesticides (Figure 4.9). In practice, if the same product was used several times in the season, a farmer might not consider it as essential to read it every time the product was used. Matthews (2007) pointed out that the reasons given for failure to read labels include (a) the language on the label was inappropriate for the area in which it was sold, (b) the font size was too small or (c) the instructions were too long and in too much detail.

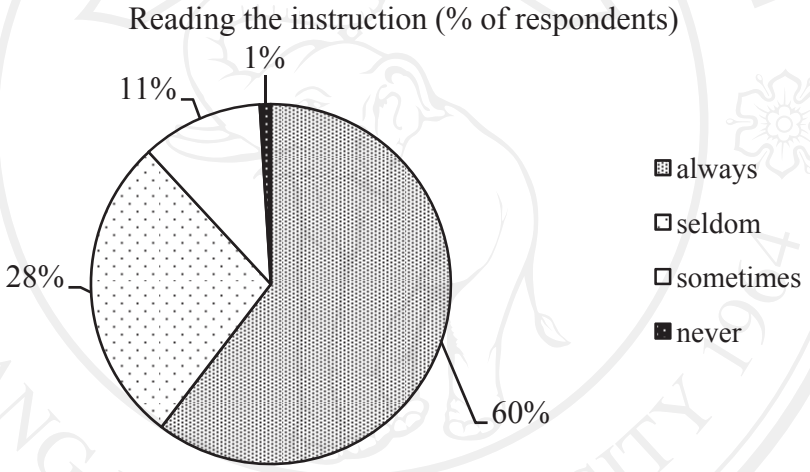

Figure 4.9 Reading the instructions (% of respondents) (n =165).

4.5.2 Amount, times and kinds of pesticides used

Figure 4.10shows that the amount of pesticides used by farmers which were well- instructed in Myanmar language. 60.41 per cent of the farmers used recommended amount and 20.8 per cent used less than recommended amount of pesticides instructed in the package. About 18.8 per cent used extra amounts of pesticides because they believed over dosage will be more effective to control the

pests and diseases. It can be assumed that those people had no knowledge about harmful effects of pesticides or those had only emphasized on their benefits without considering the consumers' health. In addition Wilson (2001) pointed out that over dosage would be increased the pests resistance to chemicals.

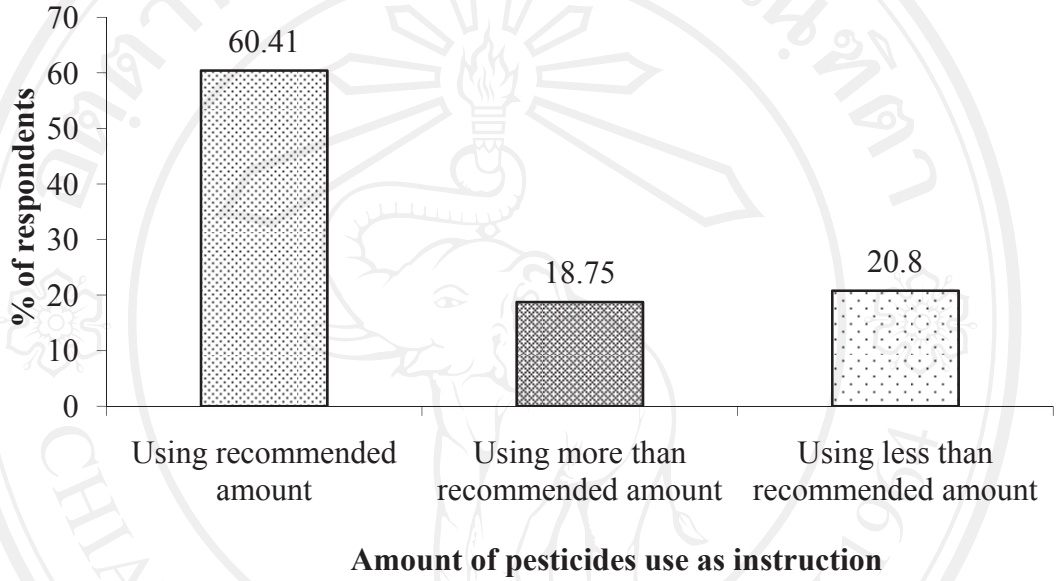

Figure 4.10 Amount of pesticides which are well-instructed in Myanmar language used by farmers (n = 165).

In the survey area, 63 per cent of the farmers in the sample sprayed pesticides whether pests attack or not. The farmers did not wait until a certain pest had been identified, but sprayed as preventive measures, before there was any visible damage to crops by pests. They either sprayed whenever there was symptom of pest attack or sprayed according to the schedule. About 35 per cent of the sampled farmers sprayed when they found the incidence of 1 or 2 pests. Only 2 per cent of the farmers sprayed when severe damage occur by pest infestation shown in Figure 4.11.

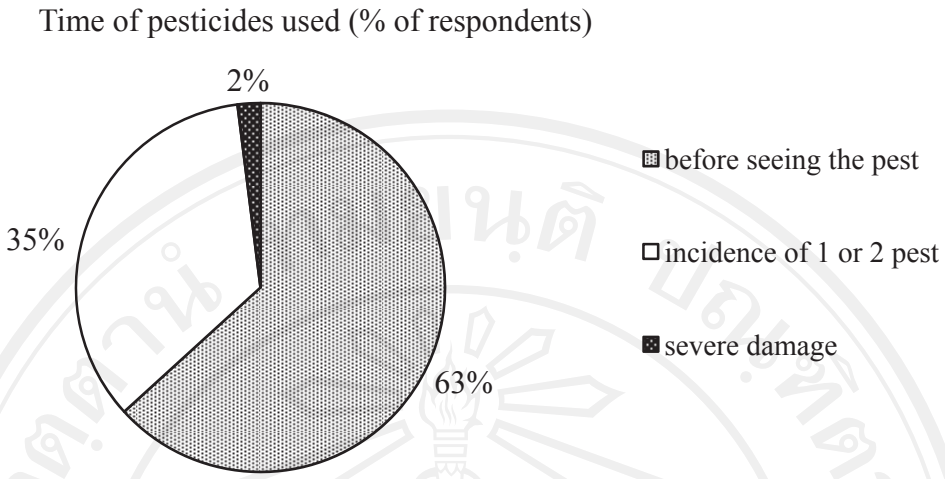

Figure 4.11 Time of pesticides used when the farmers see the pests in their field (% of respondents) (n =165).

In this study area 72 per cent of the farmers used liquid form and the rest of the respondents used powder form of pesticides.

4.5.3 Materials using in preparing pesticides application

When preparing for pesticides spraying it is necessary to stir the chemicals to dissolve and mix with water. Overall, 3 per cent of the respondents used their bare hands to stir for diluting pesticide. However over 74 per cent used bamboo sticks and 21 per cent mixed pesticide directly to the sprayer which had been shaken before spraying began. Only 1.2 per cent mixed with pesticide with the sprayer pipe displayed in Figure 4.12.

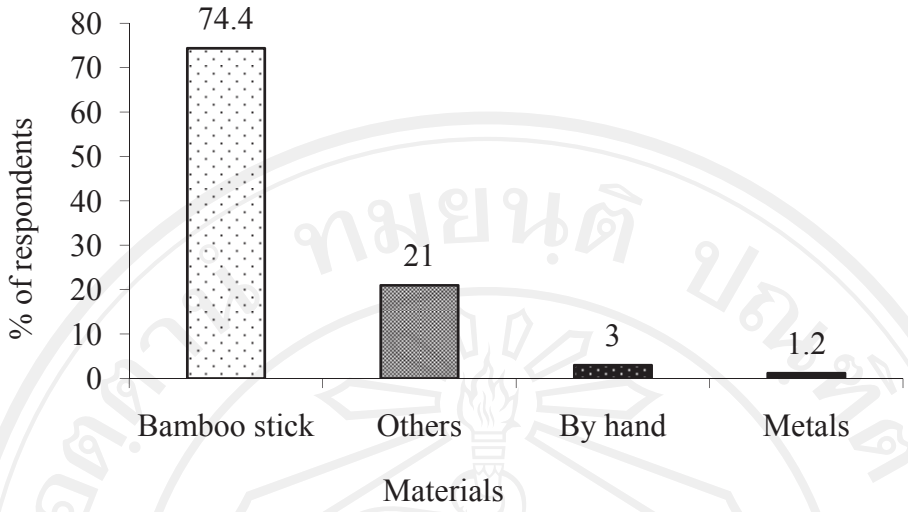

Figure 4.12 Percentage of respondents in using the materials when applying pesticides (n = 165).

About 82 per cent of the respondents sprayed their crop by themselves only 18 per cent used the hired labor for spraying pesticides (Figure 4.13).

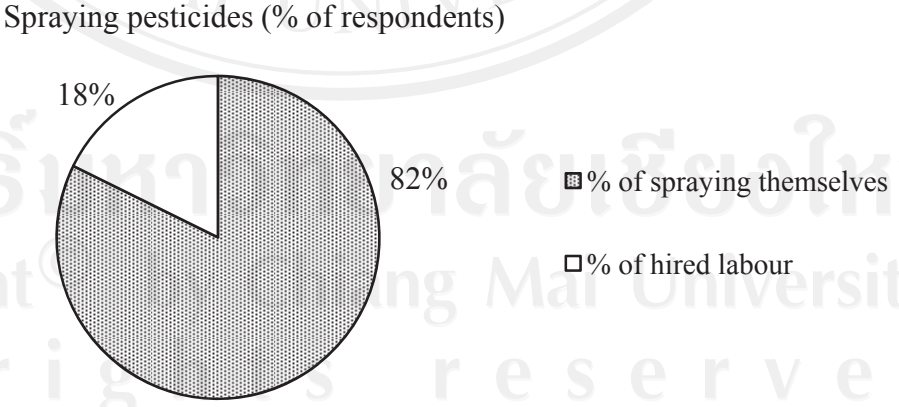

Figure 4.13 Percentage of respondents in spraying pesticides by themselves or by hired labor (n = 165).

4.5.4 Using recommended rate of pesticides

About 33 per cent of the farmers never followed the recommended rate in the pesticides containers while 67 per cent of the respondents used recommended rate of pesticides (Figure 4.14). This information was nevertheless obtained from interviews only and it could be easily overestimated.

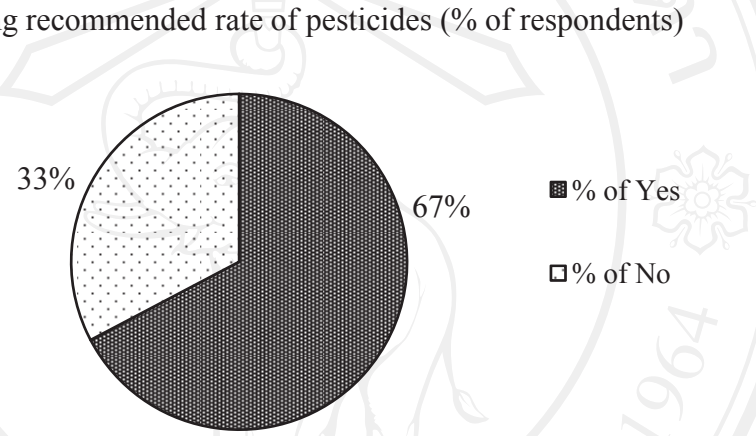

Figure 4.14Using the recommended rate of pesticides by farmers (% of respondents) (n =165).

4.5.5Places for storing and destroying pesticides containers

About 49 per cent of the farmers stored their chemicals near house (outside their house), while 32 per cent stored pesticides inside their house, a practice that would increase the risk of accidental poisoning by family members and the rest 19 per cent stored in their farm shed (Figure 4.15).

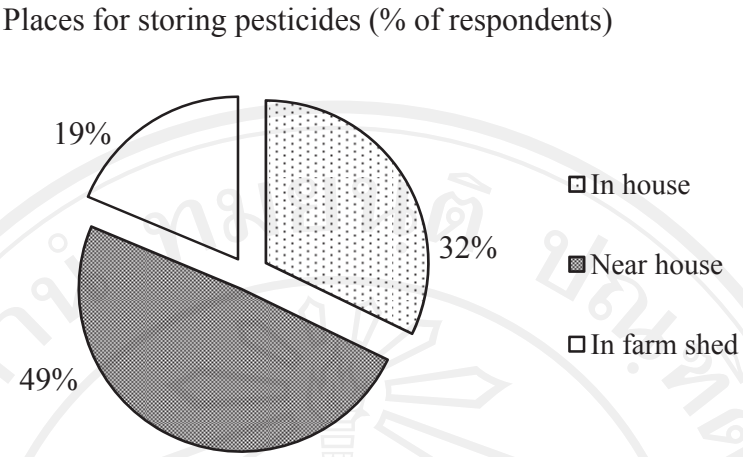

Figure 4.15 Places for storing pesticides (% of respondents) (n = 165).

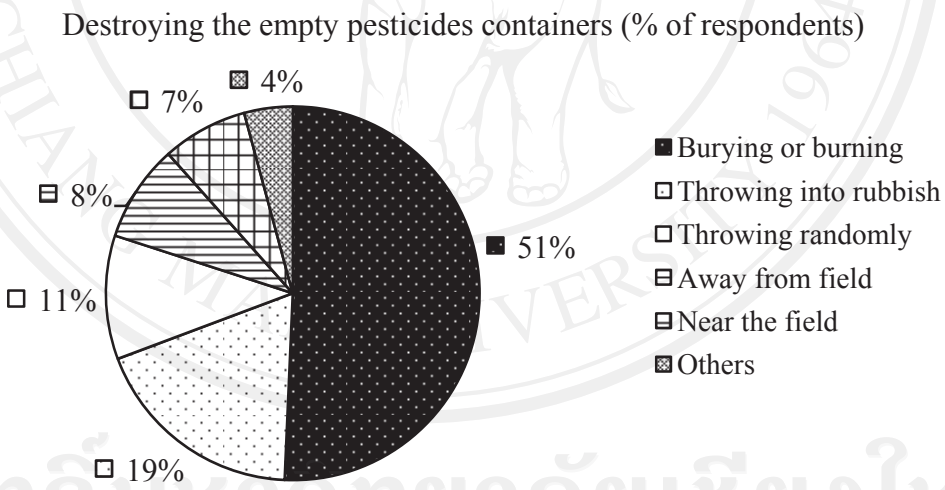

Figure 4.16 Places for destroying the empty pesticides containers (% of respondents). (n = 165)

Half of the respondents (51 per cent) destroyed the empty pesticides containers by burying or burning. Only 19 per cent of the farmers threw the empty containers into the rubbish and 11 per cent of the respondents threw randomly. Only

8per cent of the farmers threw away from their field and 7 per cent discarded near their field (Figure 4.16).

4.5.6 Preventive measures practiced by the farmers

Farmers were aware of the standard safety precautions to prevent exposure during spraying. Table 4.6 showed the percentage of farmers implied the precautions while spraying the pesticides. About 92 per cent of the farmers avoided having food during spraying and 90.9 per cent of the farmers having a bath after spraying.

Around 50 per cent of the farmers avoided talking and wore mouth cover. Nearly 51 per cent of the farmers sprayed according to the wind direction but the rest not because it was time consuming. About 42 per cent of the respondents wore protective clothing while the rest did not. It was considered too expensive and too uncomfortable to use under local climatic conditions and would hamper work output. Sivayoganathan*et al*. (1995) pointed out that farmers tend not to use protective equipment either because of discomfort or social pressure, limitation of quality and availability and the cost of equipment. Wilson and Tisdell (2001) also stated that the use of protective clothing had been insufficient particularly in less developed countries for various reasons such as lack of finance or the absence of regulations that require their use. However, most farmers considered it important to wear trousers, long- sleeve shirts, boots and hats during pesticides application. Nearly 37 per cent of the farmers refrained from smoking but only 26 per cent wore gloves during spraying pesticides. Other studies on farmers' pesticides practices had also shown that precautions were rarely taken while using pesticides (Preey*et al*., 2002 and Berg, 2001).

A few farmers (3 per cent) had a good awareness on drinking milk after using pesticides to relief from chemical residue inside their bodies.

Table 4.6 Preventive measures practiced by the farmers (during spraying)

Preventive measures practiced by farmers	Number	Percentage
Avoid from having food	153	92.72
To bathe after application	150	90.9
To wear boots	102	61.8
Avoid from talking	86	52.12
To spray according to wind direction	85	51.5
To wear mouth cover	80	48.48
To wear protective clothing	70	42.42
To refrain from smoking	61	36.96
To wear gloves	43	26.06
Drinking milk	5	3.03

Source: Survey data (2010)