CHAPTER III

RESEARCH METHODS

This study was aimed at exploring the relationships between the selected socio-demographic and institutional contexts and levels of local farmer's awareness on harmful effects of pesticides and again the awareness and the application practices. So the combination of qualitative and quantitative data analysis was applied. Primary data were collected through structured questionnaires interviews, secondary data were collected by key-informant interviews and from other published papers.

3.1 Site selection

This study was conducted between April and May 2010. It consisted of interview with farmers in Pyin Oo Lwin township where horticultural crops (vegetables and flowers) were mostly cultivated using farm inputs, particularly pesticides. These sites were selected based on crops grown (horticultural crops), pesticides usage and ease of accessibility, cooperation from local leaders and willingness of farmers to participate. The study group was selected with the help of the village staff on the grounds that they cultivate crops that require application of chemical pesticides. Figure 3.1 shows the location of the study area.

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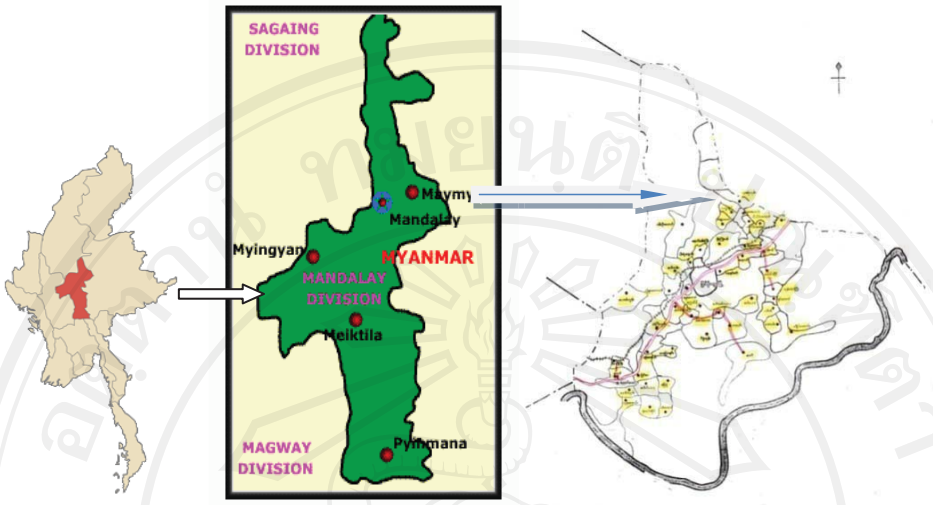

Figure 3.1 Location of the study area, Pyin Oo Lwin township, Mandalay division, Myanmar.

3.2 Sampling technique

A simple random sampling method was adopted to select households for questionnaire survey. In order to identify the total sampled household population, the name of households was taken from the registration books of the respective villages. After identification of the households, they were numbered and the sampled households were determined using a simple random sample method. Totally 165 farmers from five villages out of 47 villages were randomly selected from the target area of this study.

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3.3 Data collection

3.3.1 Primary data

Primary data were collected on household surveys, group discussion and field observation by using structured questionnaire and through interviewing farmers who

were growing vegetables and flowers. The collected data included socio-economic and institutional contexts.

In face-to-face interviews, in addition to questions defining personal characteristics such as age, education status and vegetables growing experience, growers were also asked questions aimed at finding out their views and types of practices in respect of pesticides.

The following data were collected for the pesticide practices of vegetables growers.

1. **Sources of information about pesticides use**

- Own experience
- Other growers
- Technical personnel
- Pesticides dealer
- Dealer and experience
- Dealer and technician

2. **Pesticides practice behavior types of farmer**

- Compliance with directions on pesticides container
- Use of the recommended amount of pesticides
- Use of the appropriate pesticides

3. **Precautions taken by farmers while using pesticides**

- Mouth cover
- Gloves
- Refraining from smoking
- Taking wind conditions into account
- Taking a bath after using pesticides

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- Wear boots
- Using protective clothing
- Handle carefully

4. Disposal of empty pesticides containers

- Burning or burying
- Throwing away randomly
- Throwing into rubbish

5. Careful storage of pesticides

- In farm
- Near house
- In house

6. Follow the recommendation and warning

- Not using unregistered pesticides;
- Consultation of technical personnel when using pesticides;
- Correct mixing of pesticides

3.3.2 Secondary data

In order to get the most understanding of existing situation of vegetables and flowers, secondary data were gathered from published or unpublished information about vegetables in particular and the study area in general. This information was collected form Pyin Oo Lwin Towhship Agricultural Office, Mandalay Division Agricultural Office, Plant Protection Department and Department of Horticulture under Myanma Agriculture Service.

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3.4 Data analysis

The data from formal survey and interview were analyzed using descriptive statistic. The socio-demographic data of the study area and the respondentsand their practices were expressed in terms of charts, graphs, percent and means and standard deviation in order to overcome the first objective.

3.4.1 Tobit model

Tobit regression model were applied because although the dependent variable is continuous, but its range was constrained or limited. The Tobit model is a statistical model proposed by James Tobin (1958) to describe the relationship between a non-negative dependent variable and an independent variable. The Tobit model is an efficient method for estimating the relationship between an explanatory variable and truncated or censored dependent variable.

To analyze the relationship between awareness and hypothesized independent factors, Tobit regression was applied by using Limdep (2003) software. Result of factor analysis was used as independent variables while awareness on harmful effects of pesticides index was used as dependent variable.

In mathematical form,

$$AI = \beta_0 + \beta_1 F_1 + \beta_2 F_2 + \ldots\ldots + \beta_n F_n + e$$

Where, AI = harmful effects of pesticides awareness index

β_0 = constant

β_n = coefficient for independent variables F_n

F_n = main components resulting from factor analysis

e = error term

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Table 3.1 Variables and measurements in the factor analysis

Independent variables	Measurements
Age of the household head	No. of years
Gender	Male=1, female=0
Education	No. of years
Family size	Number of household member
Farm income	Kyat per household per year
Non- farm income	Kyat per household per year
Family income	Kyat per household per year
Total cultivated land	Hectare
Growing experience	No. of years
Total number of training times	No. of times
Extension workers' visit	Yes = 1, No = 0
Information access	Yes = 1, No = 0
Get loans or financial support	Yes = 1, No = 0
Production of crops	Semi-commercial=1, commercial= 0
Sharing information about pesticides	Yes= 1, No= 0
Used of pesticides	No. of years

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Variables in factor analysis were defined in Table 3.1. In this study, socio-economic factors and institutional factors were considered in the analysis of factors related with the awareness on harmful effects of pesticides.

(1) Socio-economic factors: Age, gender, education, family size, number of dependent, total land, family income, growing experience, training received, production of crops.

(2) Institutional factors: Extension officers' visit, loan receiving

The above variables can affect the awareness of the harmful effect of pesticide and the hypotheses for the study are as follows;

(1) Age (Years)

Age can be a factor determining individuals' differences because age relates to past experiences, which make them have wider maturity and thought. A person in different ages would have different knowledge and understanding on one thing and a person with different ages usually had different capabilities and experience due to different periods of learning to make him/her learn and understand events differently.

(2) Gender (Male, female)

Sex is an important component to differentiate individuals' emotion. Mostly the head of the households are men and they are the decision makers for the agribusiness too. However the percent of women's involvement in the agricultural industry are quite a bit amount and some women are the decision makers in their families. So the research also aims to explore the awareness and sex relationship.

(3) Education (Years)

Education is a basic factor leading the individual's different knowledge. Levels of knowledge of each person will affect his / her interest in surroundings. His good and right education would lead to the social order, which could help

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prevent social problems. Therefore education was assumed as one of the most important factors which might be significantly correlated with awareness level. However some old farmers can have higher awareness according to their experience in the past.

(4) Family structure (Number)

Family size and number of dependents are considered as social capital and it can also have relation with their perception or attitudes. There are different numbers in each family but there is one same thing in all families that is family members would feel worried and take care of each other by discussing or sharing their knowledge/experience that may affect family members.

(5) Incomes (Kyats per year)

It includes farm income and off-farm income (non-farm). Family income is the sum of the former two incomes. It was very difficult to get the actual data on it as majority of the respondents are not used to keeping record of their accounting notes. However, high-income persons may have well- educated, so they have more knowledge/understanding about many matters and consequently, they may have more awareness and interest to practice than other groups.

(6) Land holding (Hectare)

Land holding can be considered as one of the wealth factors. Those who owe the larger acres of farm land can be put in the rich farmers and they might have different opportunities and situations to improve their awareness and knowledge level.

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(7) Experience(Years)

Experience is another factor directly affecting awareness because experience of each person must depend on time. Events in the social environment make people perceive and evaluate them to be their awareness, emotions, and thought.

(8) Extension content (Yes, no)

Extension education is also considered to improve the farmers' agricultural knowledge and the research supposed that if the farmers have extension contact, they can have good exposure to news and information, consequently raise the awareness level. In this study, only dummy variables were used that is only having extension contact or not.

(9) Loan receiving (Yes, no)

Status of loans receiving is also considered to be associated factor. Those who get loans from NGOs or UNDP can have much more communications with the educated staff or workers and it can influence the farmer's knowledge, attitude and perceptions.

(10) Information receipt (Yes, no)

The level of accessibility to information and media plays a vital role in improving the knowledge and awareness. In addition, those with high level of media exposure can have up-to-date information and have more varieties options to follow.

(11) Production of crops (Semi-commercial, commercial)

This factor is also important to consider because the growers who grow the vegetables for semi-commercial production they might not be used over

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dosage of pesticides. But for the purpose of commercial production people might use large amount of pesticides for their net revenue.

(12) Sharing information on harmful effects pesticides(Yes, no)

Sharing information between family members and within the neighborhood is also need to consider for the sharing information receiving form other places.

3.4.2 Factor analysis

Factor analysis was used to extract the main components which have high multi-collinearity from varieties of independent variables by using rotation method. The variables with highest loading were selected and named the component according to the commonness of variables.

The factor scores of the main components were used as independent variables in Tobit regression analysis to find the relationship with awareness index (dependent variable).

Then another Tobit regression equation was analyzed to find out the relationship between indexes of awareness of on harmful effects of pesticides (AI) and behavioral index of practices (BI). Here AI was used as independent variable together with other variables while BI was used as dependent variable.

In mathematical form,

BI= f (AI, e)

BI= behavioral index

AI= harmful effects of pesticides awareness index

e = error term

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3.4.3 General Hypotheses

(1) The selected socio- demographic and institutional contexts influence the awareness of growers' on harmful effects of pesticides.

(2) The vegetables and flowers growers' awareness on harmful effects of pesticides influence their practices.

Specification on Hypothesis

Hypothesis (1)

Null hypothesis (H_0): The selected socio-demographic and institutional contexts have no relationship with harmful effects of pesticides awareness index.

Alternative hypothesis (H_1): The selected socio-demographic and institutional contexts have relationship with harmful effects of pesticides awareness index.

Hypothesis (2)

Null hypothesis (H_0): The vegetables and flowers growers' awareness on harmful effects of pesticides does not influence their practices (behavior)

Alternative hypothesis (H_1): The vegetables and flowers growers' awareness on harmful effects of pesticides influences their practices (behavior).

If there is no significant correlation between awareness on harmful effects of pesticides and pesticides used practices, null hypothesis will be accepted and alternative hypothesis will be rejected. If there is significant correlation between AI and BI, null hypothesis will be rejected and alternative hypothesis will be accepted. If alternative hypothesis is accepted, the regression between the Awareness Index of harmful effects of pesticides (AI) and pesticides use Behavioral Index (BI) will be studied and the positive or negative relationship of independent and dependent variables will be identified.

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3.4.4 Developing Awareness Index (AI) and Behavioral Index (BI)

(a) Developing Awareness Index (AI)

The awareness of the farmers on harmful effects of pesticides index were calculated as index scores by using set of questionnaires concerning about the opinion on the use of pesticides. There were 15 questions included in scoring awareness index. The aimed was to explore the farmers awareness based on their knowledge so different orientations of both positive and negative statements on using pesticides practices were mixed in the questionnaire randomly shown in Table 3.2.

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Table 3.2 Vegetable growers' harmful effects of pesticides awareness based on their knowledge

No.	Impacts	1	2	3	4	5
1	Pesticides are very effective and essential in crop protection					
2	Pesticides can cause serious environmental pollution					
3	Pesticides should not be used more in the future for the sake of protecting harmful effects					
4	Pesticides are very dangerous to health as well as natural environment					
5	Pesticides can be handle/used easily					
6	Present rate of pesticides usage is reaching the harmful level					
7	Pesticides should be the last choice in pest control					
8	Mono cropping increase pest and disease outbreak					
9	All insects in the field will cause yield loss					
10	Crop rotation or multiple cropping can improve soil fertility and reduce insects/disease outbreak					
11	Insecticides will kill not only pests but also other beneficial insects and organisms					
12	All insects in the field need to be killed					
13	Some insects and animals are beneficial to crops production					
14	The use of pesticides in the region is very serious					
15	Heavy application of pesticides is one of the reasons to protect the reduction of crop yield					

Note. 1= strongly disagree 2= disagree3= neutral4= agree5= strongly agree

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The level of agreement on each given statement was scored according to the orientation of the question. For instance the option, “strongly agree” was scored as “5 points” for the positive question while “1 point” for the negative one. On the other hand, “strongly agree” was scored as “1 point” for the positive question and “5 points” for the negative one. The option “neutral” was scored as “3 points” and it is supposed to be the midway of agreement (neither agree nor disagree) or the condition that the respondent does not have any idea about the give statement shown in Table 3.3.

Table 3.3 Scoring system by the orientation of the statement

Level of agreement	Scores for positive statement	Scores for negative statement
Strongly agree	5	1
Agree	4	2
Neutral	3	3
Disagree	2	4
Strongly disagree	1	5

Then the scores were summed and the awareness index was calculated by using the following formula (Lwin, 2006).

$$AI = \frac{SS - \text{minimumpossiblescores}}{\text{difference between maximum and minimumpossiblescores}}$$

$$AI = \frac{SS - 15}{60}$$

AI = Awareness Index

SS = Sum of Scores

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(b) Developing Behavioral Index (BI)

Scoring scheme for the farmers' Behavioral Index based on the farming practices and their attitudes on farming activities which were measured according to the degree of orientation to conservative mood. Proxy questions were mostly used to check the farmers' attitudes and degree of dependency on the use of pesticides, to evaluate the level of their consciousness on its side effects or possible negative consequences and to detect how much they have care on utilization of pesticides. There are 12 questions applied in the Behavior Index. The major purpose of this measurement is to identify the respondents with respective level in term of safety use and potential use of pesticides. Each question was scored in loading percent based on the importance of the question and the total maximum scores were 100 (Table 3.4).

For the questions number 1, 2 and 4: if the respondents said "Yes", the 5 score will be obtained. For the questions 6, 7, 8, 9 and 10: if the answer is "Yes", 10 scores will be obtained. For the questions 5 and 11: the minimum score (zero) will be obtained when the answer is "Yes" because of negative questions. For question number 3: if the respondents choose the option 'apply when the pest attack occur', 5 scores will be paid and the rest option will be obtained zero. For the question 12 there were three options; first option will be scored zero, second for 5 scores and third for 10 scores respectively.

Then the scores were summed and the behavioral index was calculated by using the following formula (Lwin, 2006).

$$BI = \frac{\text{Gainscore}}{\text{Maximumscore} \quad (100)}$$

BI= Behavioral Index

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Table 3.4 Scoring scheme for Behavioral Index on pesticides used

No.	Pesticides use practices	Category	Scoring	
			Min.	Max.
1	Consultation technical personal when using pesticides	Yes □ No□	0	5
2	Reading the instructions	Yes □ No□	0	5
3	Timing of pesticides application	Apply when the pest attack occur Apply whether pest attack or not	0	5
4	Compliance with pre-harvesting interval	Yes□ No□	0	5
5	Use of unregistered pesticides	Yes□ No□	0	10
6	Use the recommended amount of pesticides	Yes□ No□	0	10
7	Taking the necessary precautions during and after pesticides use	Yes □ No□	0	10
8	Careful disposal of pesticides containers	Yes □ No□	0	10
9	Careful storage of pesticides	Yes □ No□	0	10
10	Correct mixing chemicals	Yes □ No□	0	10
11	Future intention to use	Yes □ No□	0	10
12	Trends of pesticide	Have been using and will be using Have used but thinking to reduce Have used but have already reduced	0	10
				100

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