CHAPTER 3

RESEARCH METHODS

This chapter presents the description of the study site, selection of study site, sampling technique, data collection and data analytical tools.

3.1 Site selection

Paukkaung township is the largest sugarcane growing area. AS it is a typical agricultural area in Pyay district with different agro-ecological factors and farming systems, it was selected for this study (Figure 3.1). As they are situated in different sugar mills' zones, different distance from their representative sugar mills, different soil fertility, different cultivation practices and different soil fertility managements, three villages, namely Nyaung Pan Thar, Vaw De Gone and Thet Yaung Pyan were selected for conducting field survey and they are the representative sugarcane production area on the rain-fed condition. This study was conducted from April to May 2011. It consisted of interviews with 120 farmers in the selected villages, in Paukkaung township.

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 names of households were 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 120 farmers from three villages out of 28 villages were randomly selected from the target area of this study.

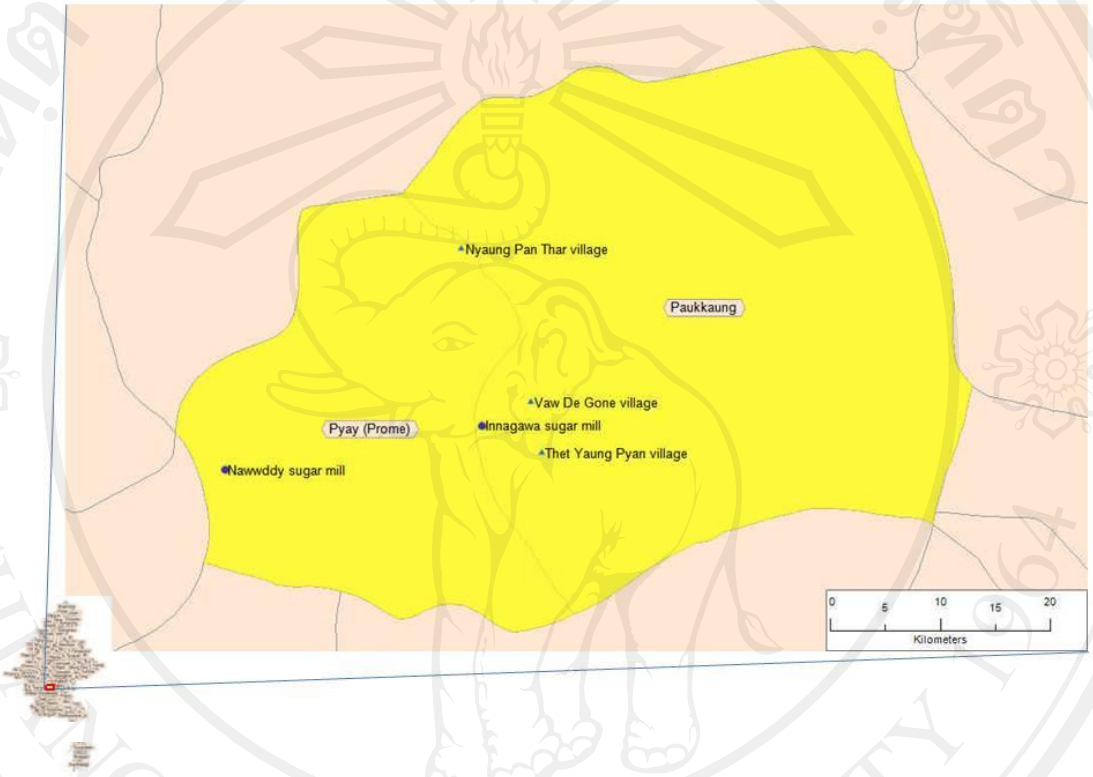

Figure 3.1 Location of the study area, Paukkaung township, Bago division (west), Myanmar

3.3 Data collection

In order to obtain the necessary information for qualitative and quantitative analysis, data were gathered from both primary and secondary sources.

3.3.1 Primary data

Data were collected from the 120 sampled farmers through face-to-face interviews using a semi structured survey questionnaire during the period from April to May 2011. The head of a household was considered as sampling unit. A pilot survey was collected through key informants, households and institutional interviews. Information sought included the current nutrient management practices, knowledge level of sugarcane growers about ISNM in the study area and included demographic, physical, socio-economic and institutional contexts.

In individual interviews, in addition to questions defining personal characters such as gender, age, education level and farm experience, sample farmers were also asked questions aimed at finding out their sugarcane yield and the profitability of different soil nutrient management practices.

3.3.2 Secondary data

In order to gain better understanding of the current nutrient management practices and knowledge levels of sugarcane farmers in the study area, secondary data were gathered from published or unpublished information related to sugarcane in particular and the study area in general. The secondary data of total sugarcane area, total sugarcane production, the average national yield, total sugar production and other relevant information was collected through Paukkaung township office, Pyay

zone office and head office of Sugarcane Division under Myanma Industrial Crops and Development Enterprise (MICDE) and Department of Agricultural Planning (DAP) and other references related to the research objectives.

3.4 Data analysis

The collected data (both qualitative and quantitative) were firstly entered into the Microsoft Excel program. Then, the data were re-entered into LIMDEP software. Descriptive statistics, multiple regression and ordered probit models and gross margin analysis were used to fulfill the three objectives of the study.

3.4.1 Descriptive Statistics

Descriptive statistics was applied to describe the current nutrient management practices, the socio-economic profile of farmers such as farmers' personal characters, economic and biophysical characteristics, and present farming technology, existing farming practices of the sampled farmers in the study area to fulfill the first objective. The results were expressed in such as statistics such as frequency distribution, percentage, graph and tables.

3.4.2 Econometric models

This section presents two econometric models designed to analyze the relationship between farmers' knowledge levels about ISNM (dependent variable) and selected independent variables and gross margin analysis to compare cost and revenue of sugarcane production system.

3.4.2.1 Multiple regression model

It was assumed that dependent variable was a linear function of independent variables in this study. Therefore, through regression analysis, it was possible to estimate how much variation in the dependent variable (farmers' knowledge level about ISNM), was caused by the independent variables. The degree of relationship between farmers' knowledge about ISNM and each selected farmer's demographic variables was determined by the use of Ordinary Least Square (OLS) multiple regression technique. The model was

$$Y=\beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3Y+ \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7+e \quad \text{---------- (1)}$$

Where,

Y= farmer's knowledge level about ISNM

β_0= the Constant or intercept

β_1, β_2, β_n= the coefficient of estimation

e=Random error term

X_1= Age of household head (years)

X_2= Gender of household head (male/female)

X_3= Education level of household head (levels)

X_4= Farmer's experience in cane cultivation (years)

X_5= Location of cane farmers (village)

X_6= Extension contact (time/season)

X_7= Farmer participation in field demonstration (time/season)

X_8= Membership of farmers' organization (yes/no)

The detailed definitions of the independent variable are presented in Table 3.1.

3.4.2.2 Ordered Probit model

To determine the factors that influence on knowledge levels about integrated soil nutrient management of sugarcane growers, the above-calculated dependent variable was then regressed on the set of socio economic variables, using the Ordered Probit Model.

Farmers' knowledge level about ISNM was computed as dependent variable. The ordered probit model for different knowledge levels about ISNM can then be specified as follows:

$y^* = \beta X_i + e_i$ ---------- (2)

$y^* = 1$, low knowledge level if farmer's score $< (\bar{x} - SD)$ value

$y^* = 2$, medium knowledge level if $(\bar{x} - SD) <$ farmer's score $< (\bar{x} + SD)$ value

$y^* = 3$, high knowledge level if famer's score $> (\bar{x} + SD)$ value

Where, $\bar{x}$ = Mean of knowledge about ISNM

SD = Standard Deviation

β = Coefficient of independent variable

X_i= Independent variables

e_i=Random error term

The farmers' knowledge about ISNM was scored from the number of ISNM practiced using 46 questions that being related to the crop rotation, cereal legume intercropping, (improved) fallowing, composting, green manuring, animal manure, and chemical fertilizers based on Lickert scale method. The mean and standard deviations of measurements were used to categorize the respondents' knowledge level (y*) into three groups viz., low, medium and high levels of knowledge. The general form to identify farmers' knowledge scores was computed as follows:

$y_i = \sum_{i=1}^{n}(x_i)/n$ ---------- (3)

Where, *i*=cane farmer *i*th of 120 sampled farmers

x_i= number of ISNM practiced from 46 questions

n= total ISNM questions (46)

In order to determine farmers' knowledge levels on ISNM, the sugarcane farmers in the study area were asked and scored by asking 8 questions that are related to integrated soil nutrient management practices in sugarcane farming system.

Keeping in view the objective of the study, demographic, socio-economic, physical and technological variables such as farmers' age, gender, education, sugarcane farming experience, region, extension contacts and social participation in field demonstrations and framer organization were collected as independent variables shown in Table 3.1.

Farmers' different knowledge levels on ISNM were computed as dependent variable and the hypothesis testing was done to find out the relationship between demographic, socio-economic, physical and technological factors and famers' different knowledge levels about integrated soil nutrient management of sugarcane growers.

Table 3.1 Definition of independent variables in predicting knowledge levels of ISNM in sugarcane production system at Paukkaung township, Myanmar

Probit Variable Name	Description	Expected sign
AGE	Age of head of farm HH (years)	+
GENDER	Gender of head of farm HH(1= male, 0= female)	+
EDUCATION	Education level of head of farm HH (EDU1, EDU2, EDU3, and EDU4)	+
SUGARCANE EXPERIENCE	Years of sugarcane farming experience(years)	+
LOCATION	Region where farmers live in (1= Nyaung pan Thar, 2= Vaw De Gone, 3=Thet Yaung Pyan)	+/ -
EXTENSION	Farmer's contact to extension officer field visits (Time/season)	+
DEMOPART	Farmer's participation in field demonstrations (Time/season)	+
MEMBER	Membership of farmer organization (1= yes, 0= no)	+

(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 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)

The head of household is the implicit key decision–maker for his or her house-

hold. Empirical evidence shows that male-headed households in the developing countries have more high knowledge and a higher access to resources and information that give them.

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 knowledge and sex relationship.

(3) Education (levels)

Education is a basic factor leading the individual's different knowledge. Education helps people to increase their knowledge and understanding about ISNMPs. It is often believed that higher education gives farmers the ability to perceive, interpret and respond to new information much faster than their counterparts with lower education. Therefore education is assumed as one of the most important factors which might be significantly correlated with knowledge level. Education level positively significantly influenced access to ISFM information/knowledge. In my study, EDU1 means that the cane farmers who had passed only primary level of their education, EDU2 means that the cane farmers who had passed secondary level of their education, EDU3 means that the cane farmers who had passed high level of their education and EDU4 means that the cane farmers who had graduated of their education.

(4) Experience in cane cultivation (Years)

Experience is another factor directly affecting knowledge level. Events in the

social environment make people perceive and evaluate them to be their knowledge, emotions, and thought. This helps improve their knowledge about farm management. Farming experience also shows positive effect on farmers' perception. This significant positive effect can be comprehended in such a way that farmers who run their farms for a long time develop knowledge and skills.

(5) Location

Location variable was constructed and it was hypothesized that households in high agriculturally potential area (Nyaung Pan Thar village area) would be positively associated with different knowledge level. It has different impacts on the knowledge level according to different social status, accessibility of information and communication and contact to extension officers.

(6) Extension officer field visits (Time/season)

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. Because access to extension services exposes farmers to new technologies and their potential benefits, we postulate that access to extension positively affects the farmers' knowledge.

(7) Farmer's participation in field demonstrations (Time/season)

The level of accessibility to information and media plays a vital role in improving the knowledge and awareness. If farmers participate in field demonstrations, they will access the information and technology and it will improve knowledge level of farmers.

(8) Membership of farmer organization (Yes, no)

By participating in local farmers' organization, farmers will accept normally information among organization members and within the neighborhood and it is also need to consider for the sharing information receiving form other places. Group membership denotes whether any household member belonged to any group. Membership in groups may expose individuals to a wide range of ideas and sometimes afford farmers the opportunity to have better access to information, which may either cause them to form a different levels of knowledge.

3.4.2.3 Gross Margin Analysis

The data on cost and revenue of sugarcane production was analyzed by using gross margin to determine the profitability of different soil nutrient management practices (no use fertilizer and FYM, use of only urea, use of urea plus biocomposer, use of urea, biocomposer and FYM and use of compound fertilizer plus FYM) and of different knowledge levels (low, medium and high) on ISNM. Gross margin for an item is the sales revenue obtained from the item sold, minus the direct costs of producing and selling the item. Therefore gross margin is a good indication of how profitable an enterprise is initially although, finally, fixed costs should be deducted.

The variable cost for cane production includes cost of land preparation, cost of sowing, cost of inputs (seed, fertilizers and manure), cost of earthing up, cost of hired labor, cost of harvesting and transportation. Goss revenue was computed multiplying the price of a unit of output by total amount of output. Family labor was computed as opportunity cost. Price was considered as the farm gate price.

In order to measure the profitability of cane production in Paukkaung township, gross margin of farm households was conducted as follows:

$$GM = GR - TVC \quad \text{---------- (4)}$$

$$GR = \sum_{i}^{n} Q_i P_i \quad \text{---------- (5)}$$

$$TVC = \sum_{i}^{n} P_j X_j \quad \text{---------- (6)}$$

Where, GM = Gross Margin (kyat/ha)

GR = Gross Revenue (kyat/ha)

TVC = Total Variable Cost (kyat/ha)

P_i = the price of output P_i(kyat/ha)

Q_i = the quantity of output (#/ha)

P_j = the price of variable input j (kyat/ha), and

X_j = the quantity of variable input j (#/ha)

Note: 1 US$ = 813 kyats (May, 2011, during the time of field survey)