CHAPTER III

RESEARCH METHODS

This chapter focuses on describing the steps, methodology to carry out the study. Composition of the chapter includes some main sections such as the conceptual framework; scope of the study; site selection; data collection; and analysis.

3.1 Conceptual framework

Litchi is a perennial and life-long cycle fruit tree and it is very sensitive with changes in environmental condition such as temperature, moisture, water, and fertilizer. Owing to these, its characteristics are quite different from the annual crops, which are harvested and replanted each season by making more chances for insect pests to attack, reproduce, and damage. To solve the objectives of the study and to have an overall view, a conceptual framework was constructed (Figure 3.1). The first two steps – collection of the secondary data and field survey, are necessary to implement in order to get data to support for problem and data analyses later in the upland and lowland litchi production systems. Continuously the workshops and farmer interviews were organized and carried out in each district to discuss and extract information relating to the litchi cultivation systems and farmer's insect pest management practices. Through problem and data analyses, effective strategy in farmer's insect pest management will be identified.

3.2 Scope of the study

The study focused on the litchi farmers in two litchi production systems, upland and lowland in Haiduong province, northern Vietnam. Basing on the memory recall and recollections of the respondents, cross-sectional data and information of litchi production year 2002 were collected. This year was considered as a normal production with regards to weather condition, slightly serious damage of insect pests and low price.

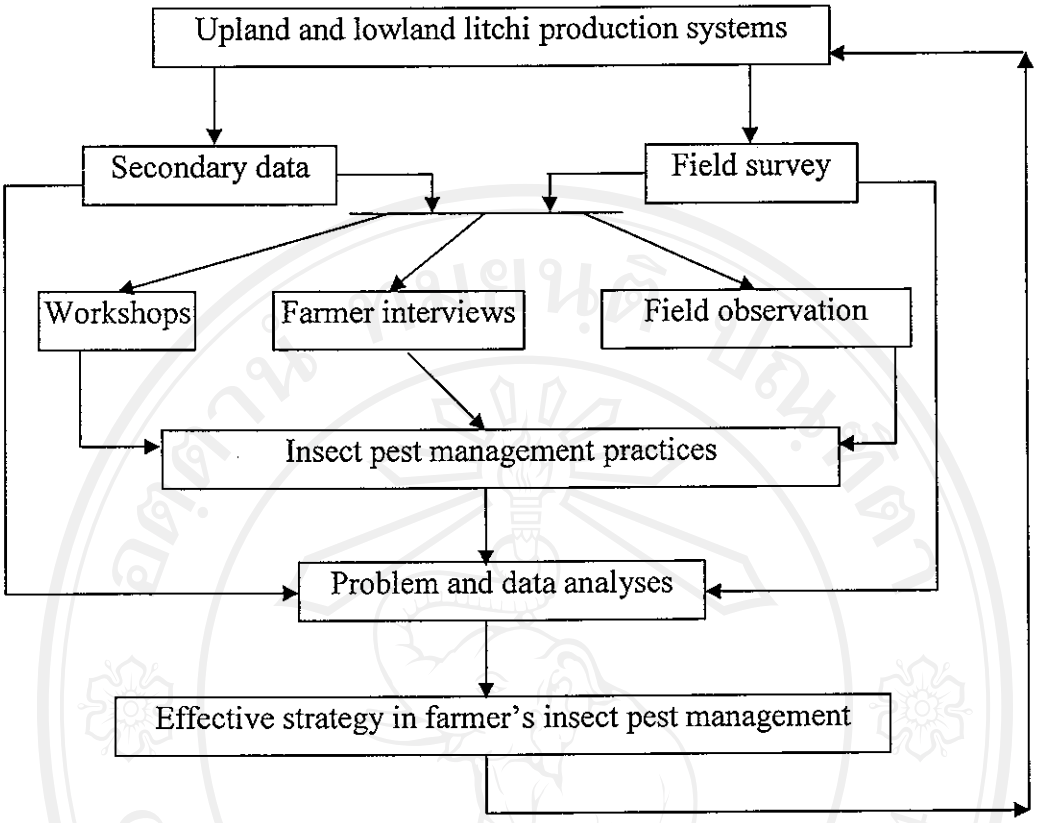

Figure 3.1 Conceptual framework of the study

3.3 Site selection

Northern provinces of Vietnam are considered as sub-tropical climate region where litchi tree could be cultivated, flowering and fruiting well. However litchi is cultivated mainly in some provinces such as Bacgiang, Haiduong, Quangninh, and Thainguyen. Haiduong is the province with very large area of litchi cultivation and considered as the cradle of the major commercial cultivar "Thieu Thanhha" (Le *et al.*, 2000) and has two massively cultivated upland and lowland litchi production systems. The study will focus on understanding practices as well as characteristics of two litchi production systems especially in farmer's insect pest management strategies in two districts under Haiduong province, Vietnam (Figure 3.2).

Thanha and Chilinh are two districts under Haiduong province. Thanhha is lowland plain district, where the most old age of litchi cultivation found with 75 km

away from the Hanoi capital of Vietnam, and Chilinh is upland hilly and newly established litchi cultivation district with a distance of 95 km from the Hanoi. The study has been carried out within the two representative communes for each litchi production system (Thanhxa and Thanhthuy communes of Thanhha district, Leloi and Conghoa communes of Chilinh district). These communes were chose to make sure that they could cover the information necessary for the study.

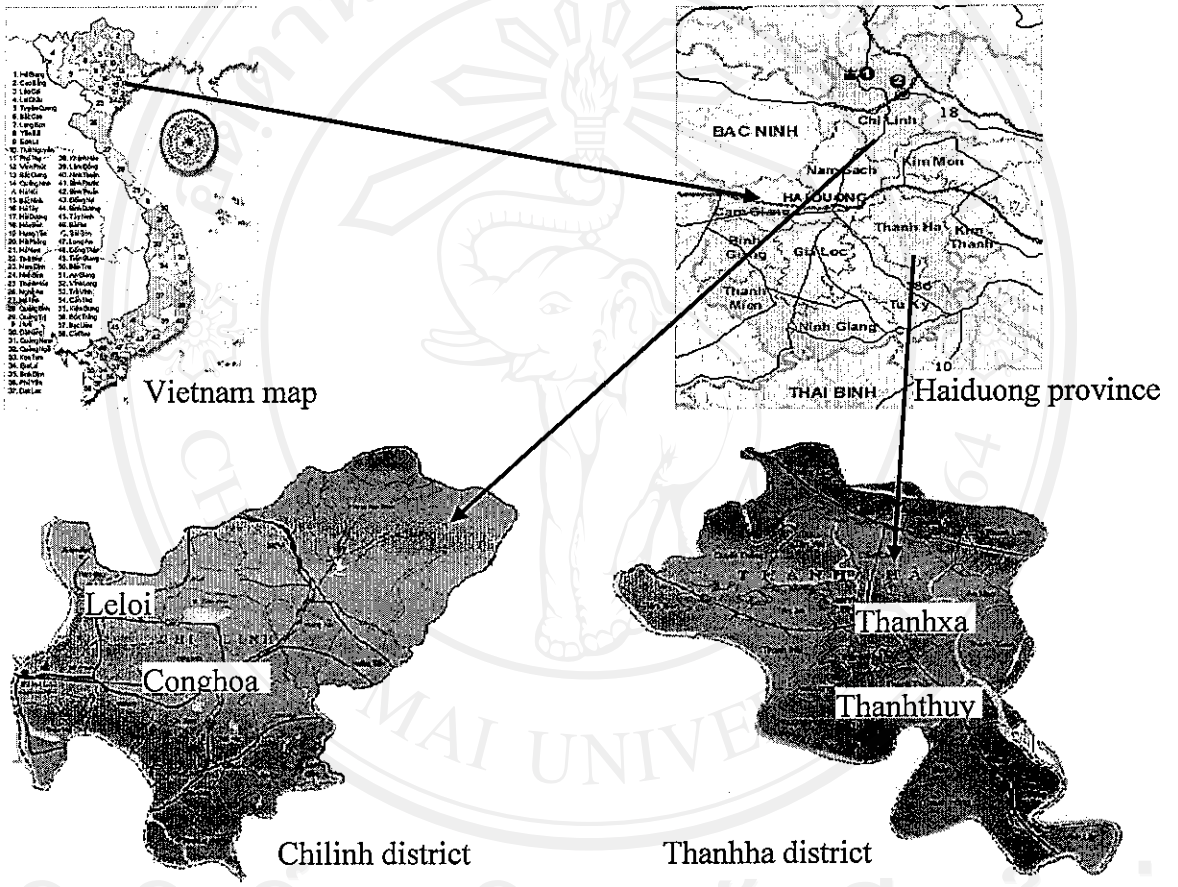

Figure 3.2 Map of the two studied districts, Haiduong province, Vietnam

3.4 Data collection and analysis

To implement the study, the litchi farmer interview was carried out to collect primary data from March to December 2003 by using questionnaire. 39 farms in Thanhha district and 40 farms in Chilinh district were collected randomly from a recommended list of farms. Besides this, field survey and secondary data were also implemented and collected to support for the primary data in process of problem and

data analyses. Lastly, all of them are analyzed by using simple descriptive statistics method from the full package of excels software.

3.4.1 Primary data

The structured and semi-structured questionnaire was designed and pre-tested before conducting the formal survey in order to get adequate data and to omit ambiguous data. The questionnaire was designed by consulting with the litchi and plant protection experts and pre-tested first with 5 good experienced farmers from each system. The final questionnaire was completed after adjusting many questions in accordance with actual circumstance. Before interviewing, a workshop was organized in each system by the participation of commune leaders, elders, key farmers, researchers, and plant protectionists. The main aim is to discuss about issues relating to characteristics of two litchi production systems, control practices, constraints and opportunities in insect pest management. Individual techniques were used to collect data from the farmers selected above. Individual techniques included face to face interviews, questionnaires, and field observations. These techniques are aimed at capturing all the aspects of the litchi production systems to provide sufficient information and data as required by the thesis's objectives.

Interviews were conducted in Vietnamese language either at the farmers' home or in litchi fields situated within two to three km away from the farmers' homestead. Informal survey data was collected from plant protection agents, researchers, village leader, and elder to elucidate the general characteristics, problems, and opportunities of the study area.

Field observation was also carried out to get more information on farmer's insect pest management and production practices. This was also an opportunity to enable cross-checking between farmer's answers and practice. Other activities of the field observation were measure height and canopy width of the tree, and monitor of insect pest fluctuation in two systems. To measure the height and canopy width of the tree, it was taken randomly 40 of the 10-year "Thieu Thanhha" litchi trees from each district to measure height and canopy width. To identify fluctuation of insect pests in

two systems, one about 10 years old litchi orchard of around one hectare was chosen to monitor the fluctuation of the insects in each system (Department of plant protection, 1997). Five litchi trees were selected randomly from each orchard, then chose two bunches of flower or fruit randomly from each of 4 sides, counted number of insects on each bunch and get mean from each investigation time. In the case of the fruit borer, to get fluctuation, 20 pheromone traps were hung dispersedly inside canopy of the litchi orchard with from 1.2 m to 1.4 m above the ground. The traps were renewed every 20-day; counting numbers of moth on each trap and get mean from each investigation time. Investigation interval was 10 days, beginning time was on 12 March (nearly blooming) and the ending at the time of near harvest - 21 May 2003.

The main information required to meet the addressed objectives of the study included the following:

1. General information on the household such as age, structure of the household member, labor force, education attainment, family size, and farming experience in two litchi cultivation systems.

2. Characteristics of litchi orchard such as farm size, tree density, tree age, tree height, canopy width, yield, productivity, and cropping systems in two litchi cultivation systems.

3. Cultivation practices such as pruning, fertilizing, irrigation, and utilization of labor force, harvesting, and insect management in two litchi cultivation systems.

4. Practices in insect pest control such as composition of insect pests, the important insect pests, control practices and identifying the fluctuation of the insect pests.

5. Component of criteria needed to identify effective strategy in managing insect pests such as costs of labor and insecticide, total income, efficient ratio of each strategy, mutual effects among methods in each strategy, sustainability under external factors, and preference of the farmers in insect pest management.

3.4.2 Secondary data

The source of the secondary data included various publications such as journals, unpublished research works, literature, reports, proceedings, documents of the ministry of agriculture and rural development and other relevant ministries, organizations and bodies; key informants and personal observations.

3.4.3 Data analysis

Simple descriptive statistics method was employed to analyze and explain the general information on the household, the characteristics of litchi orchard, the cultivation and insect management practices by using mean, minimum, maximum, and standard deviation. To meet and elucidate requirement of the second objective, identifying important insect pests, scoring method (Merrigan *et al.*, 1996) was established to weight insect pests in Equation 3.1.

To determine farmers' control practices, some criteria were established such as types of insecticide used, dosage, timing, pruning, hand removal, how to spraying, pruning and hand removal, etc. Simple descriptive statistics method will be used for this objective.

$$W_j = \Sigma \frac{R*S_i}{N} \quad \text{..... (3.1)}$$

Where:

W_j: average score of j^{th} insect pest

S_i: scale of i^{th} rank order (i is from 1 to 5)

R: number of respondents assigning for S_i

N: total reported respondents

Equation 3.1 Scoring method to identify the important insect pest

In order to identify effective strategy in farmer's insect pest management, first of all, economic efficiency of the effective strategy is identified in Equation 3.2 (Nguyen, 1999a).

$$BCR = \frac{B}{C} \quad \text{..... (3.2)}$$

Where:

BCR: benefit-cost ratio for identifying the effective strategy; the more BCR is high, the more strategy is effective.

B: benefit from litchi production.

C: cost for buying insecticide or hiring labor to control insect pest

Equation 3.2 Efficiency of strategy in insect pest management

Continuously some criteria were taken and application of scoring method (Malczewski, 1999) for each criterion was established to weigh the effective strategy in order to support for analyzing process as follows:

- Insecticide cost (IC): highest: 1 - slightly significant; second highest: 3 - significant; third highest: 5 – very significant; lowest: 7 – the most significant

- Labor cost in insect pest management (LC): highest: 1 - slightly significant; second highest: 3 - significant; third highest: 5 – very significant; lowest: 7 – the most significant

- Benefit-cost ratio of the strategy (BCR): highest: 7 – the most efficient; second highest: 5 – very efficient; third highest: 3 – efficient; lowest: 1 – slightly efficient.

- Mutual effects among the methods (ME): single method: 1 – no significant; double methods: 3 - significant; triple methods: 5 – very significant.

- Sustainability of the strategy (SOS): single method: 1 – minor sustainable; double methods: 3 - sustainable; triple methods: 5 – more sustainable.

- Farmer's preference (FP): highest: 7 – the most preferred; second highest: 5 – very preferred; third highest: 3 - preferred; lowest: 1 – slightly preferred.