

CHAPTER 1

INTRODUCTION



1.1 Problems

In Thailand, the industrial development is very important policies for the government in order to boost the economics growth. Especially agricultural sector has also played an important role to support Thai population. Moreover, Thailand is the largest important exporter of agricultural products, such as rice, fruits, cassava and para-rubber. The proper geographical location of Thailand and its climate not only encourage the good harvest but also support insect life's factors. To increase agricultural production, Thai farmers, therefore prefer to use a large quantity of chemicals (chemical fertilizer, pesticide and synthetic hormone) to speed up and control their harvest, as well as to reduce and repel pest and epidemic plants.

From the Ministry of Agricultural and Cooperative's record, it indicated that the number of all pesticides imported to Thailand has continuously increased since 1991. It can be said that in 2001, Thailand imported 40,000 tons of pesticide, which was worth more than 5,000 million Baht. And the highest number of imported pesticide or approximately 12,000 tons was insecticide representing 2 billion Baht.

Because of it easy-to-buy and to use with high and rapid effectiveness, pesticide has induced Thai farmers to apply large quantities of pesticide on their farm. Pesticides, which are widely in Thailand, are the organophosphate groups since they are very effective to eradicate the insect and have shorter lifetime. Moreover, they are easier to degrade in normal environmental condition. On the other hand, organophosphate compounds are hazardous chemicals which can cause many adverse health effects to human being. Their properties will inhibit the function of the nervous system enzyme, especially Acetylcholinesterase (Cholinesterase). The severity of its poison, which effect on human being, depends on the received concentration and

duration. The severity will range from a pulmonary edema, cyanosis, muscle spasms, muscle weakness, blurred vision, respiratory difficulty and eventually death due to the respiratory failure (TOXNET). Furthermore, the pesticide residues in the environmental will cause the chemical toxic residue problems as well as contaminated in food chain and eventually to Thai people.

Tambon Bang Rieng is the largest area for vegetable farming in Changwat Songkhla. From the researcher's observation Traditional and IPM farmers use the pesticide to protect their harvest from the pest and plant's infectious disease. It can be said that the organophosphate pesticide groups are the most favorable type of pesticides used in Bang Rieng area. As the results, most farmers in this area are the victims of pesticide exposure.

The name of organophosphate pesticide which both farmer in Tambon Bang Rieng use to control the pest are methyl parathion, dicofol and chlorpyrifos. The toxicity values of these pesticides are 14, 22, 135, 162 mg/kg, respectively as shown in the LD₅₀ value in mouse.

From the usage of organophosphate pesticide in this area, both farmers are directly and indirectly exposed to pesticide residues in the soil, ground water, surface water, food and air. The effect of the pesticides exposure will decrease acetylcholinesterase level in farmers' blood system, and this will be used as the indicator of organophosphate pesticide exposure in human being.

The office of Public Health in Amphoe Khuan Nieng, (2000 & 2002), which is responsible to protect an epidemic of pesticide exposure, reported the result of blood-screening test, which is done to determine the risk of organophosphate pesticide exposure. It showed that farmers in this area were at risk to the pesticide. The numbers of pesticide victims are shown in Table 1.1.

TABLE 1.1: Acetylcholinesterase Level in Blood Sampling from the Organophosphate Pesticide Exposure in Tambon Bang Rieng

Year	Farmer Group	Number of persons	Toxicity Level from Blood Testing			
			Normal	Safe	Abnormal	Risk
2000	Traditional	79	1	19	2	18
	IPM	21	0	4	9	9
2002	Traditional	114	10	37	56	11
	IPM	11	0	1	6	4
	Consumer	19	0	2	14	3

From the above table, it can be concluded that Traditional and IPM farmers are directly and indirectly exposed to the organophosphate pesticides. The major pathways to obtain the pesticide are dermal absorption, inhalation and ingestion from pesticide residues in food, air, soil and water.

However, most researches on pesticide exposure will focus on the dermal absorption pathway, while there are a few studies on the inhalation. A study in the quantitative of exposure assessment is therefore required to assess the risk from pesticide exposure. Its concentration in the working condition is also the major source of pesticide exposure.

This study will assess the pesticide exposure by the quantitative questionnaires and evaluate the exposure concentration of the organophosphate pesticide which farmers are exposed to during their spraying. These results will be a valuable database for risk assessment in the organophosphate pesticides exposure and will be used for risk management and practice in reducing the effects and severity of pesticides to farmers at Tambon Bang Rieng from the usage of organophosphate pesticides.

1.2 Objectives:

The objectives of this study are to investigate the pesticide exposure assessment including the pesticide concentration and the pathways in the working condition. The assessment includes both qualitative and quantitative analyses by collecting and assessing farmers' behavior and their activities, which relate to the pesticide exposure. This study also aims to evaluate the pesticide concentration in the air during working condition when the farmers apply the pesticides.

The specific objectives are as follows

1. To adapt and apply Pesticide Exposure Questionnaire for assessing pesticide exposure in Thai farmers.
2. To determine the inhalation pathway exposure to Thai farmers.
3. To determine the organophosphate pesticide concentration in the air when the farmers spraying the pesticide (in working condition).
4. To evaluate the pesticide exposure between the Traditional and IPM farmers.

1.3 Conceptual Framework

Studying of Exposure Assessment of Traditional and IPM Farmers on Using Pesticides will consist of two steps in order to assess the pesticides exposure. Details are as follows:

Step I: Indirect method: To interview farmers by filling in the questionnaires which developed and adapted from Agricultural Health Study, WHO and the specialist from New Jersey, USA. The exposure questionnaire will assess the farmers' activities and their behaviors relating to the pesticide usage. Subsequently, the pesticide exposure will be assigned its score. The exposure scores from the assessment are statistically calculated by SPSS Program to determine the pesticide exposure level in farmer.

Step II: Direct method: To determine the air contaminant from pesticide by personal exposure monitoring while farmers apply the pesticide in their farms. This method evaluates the amount of pesticide and its concentration, which farmers may be exposed to or breathe into their inhalation system.

The result of both indirect and direct methods are evaluated the pesticide exposure assessment in Thai farmers.

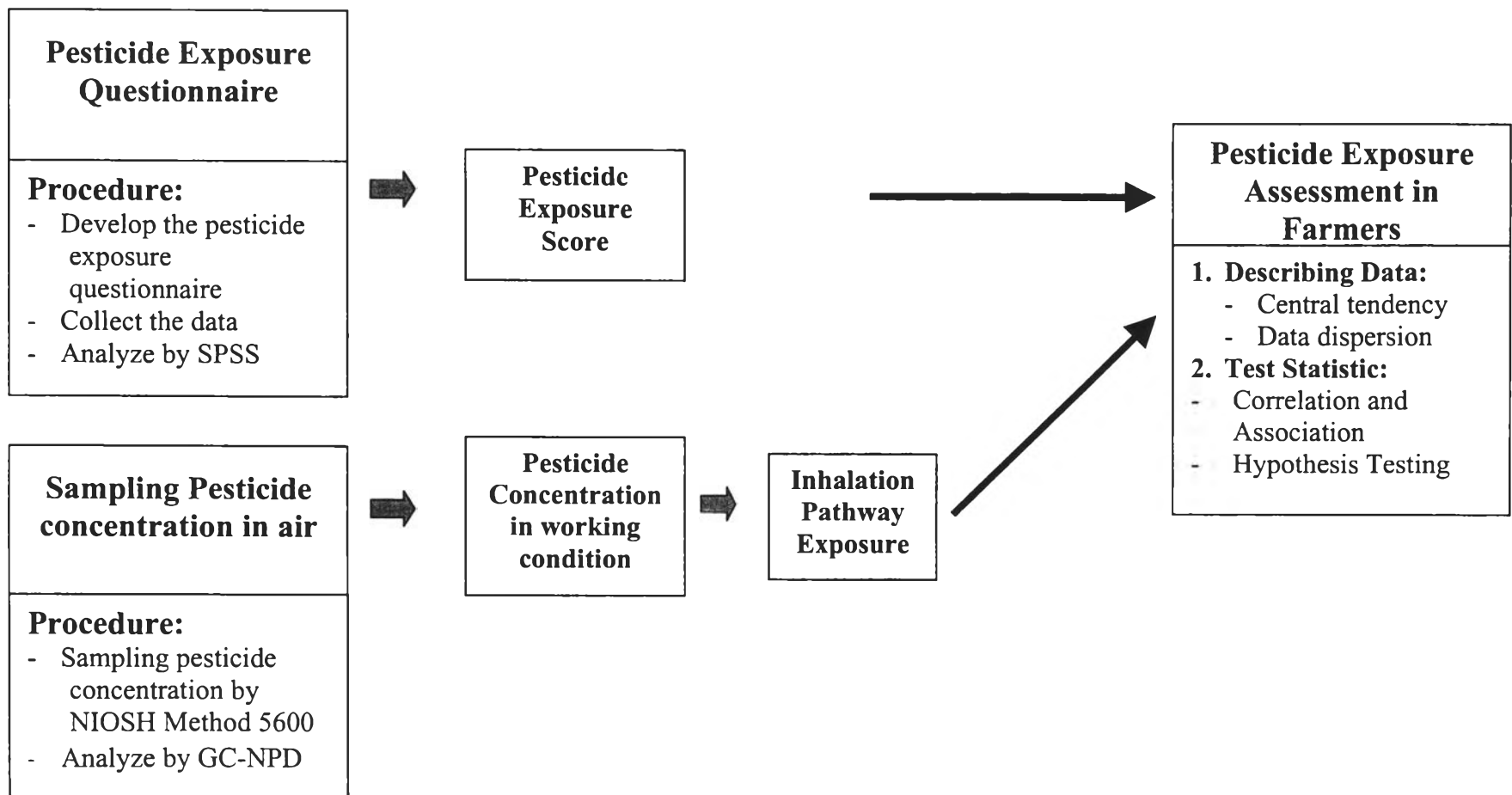


Figure 1.1: Conceptual Framework

1.4 Hypothesis

IPM farmers have lower risk of pesticide exposure than Traditional farmers.

Sub-Hypothesis:

1. IPM farmers have lower pesticide exposure score than Traditional farmers
2. IPM farmers receive lower pesticide concentration in the working air than Traditional farmers.

1.5 Definition

1. **Farmers:** Farmers who reside at Tambon Bang Rieng including the local people and the people who come from other part of the country and own vegetable farms.

Farmers will be separated into two groups as follow:-

- 1.1 **Traditional Farmers:** The farmers who mainly use the pesticide for pest control.

- 1.2 **Integrated Pest Management (IPM) Farmers:** The farmers who using the way of farming that is socially acceptable, environmentally responsible and economically viable. IPM farmers promote minimized pesticide use, but control the pest by biological method to enhance environmental to enhance environmental stewardship and sustainable agricultural systems. IPM farmers promote minimized pesticide use, but control the pest by biological method. For example, spraying the fermentation juice from Sherry Shell, margosa juice and bacteria for pest control, use crop rotation for and growing plant in the net area for protect their harvest from any pest.

2. **Organophosphate pesticide:** it will be separated into 2 cases:

- 2.1 **Pesticide Exposure Questionnaire:** organophosphate pesticides mean all of the pesticide that had phosphorus as a component in its constituent.

- 2.2 **Pesticide Concentration studies:** Researcher will focus on the widely used organophosphate in Tambon Bang Rieng, which are chlorpyrifos and methyl parathion.

- 3. Acceptable Daily Intake (ADI):** An ADI is an estimate amount of a residue in food or drinking water expressed on a body weight basis. ADI can be ingested daily over a lifetime without appreciable health risk.