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## **APPENDICES**

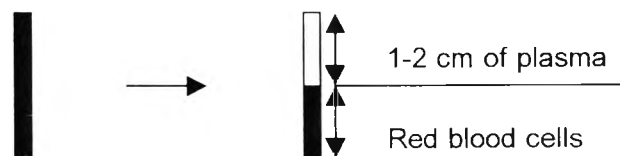
## Appendix 1: Techniques for analysis of pesticide contamination in blood using reactive papers without centrifugation.

### Materials

1. Reactive papers
2. Cotton
3. Alcohol
4. Lancet
5. Slides
6. Capillary tubes
7. Paraffin wax
8. Forceps
9. Gloves
10. Droppers

### Procedure

1. Clean the fingertip where a blood sample is to be collected with cotton wet with alcohol
2. Collect a blood sample in a capillary tube using blood collector kits
3. Place the capillary tube up right and allow the sample to segregate into 2 layers of plasma and red blood cells as in the following:



4. Place a reactive paper for testing of pesticide allergies on a slide.
5. Break the capillary tube at the interfaced point between the plasma and red blood cells layers.
6. Turn over the plasma tube and then apply its top end (indicated by a red line) onto the test paper (or using a dropper) until the plasma disperse to wet the whole paper.
7. Cover the sample with another clean slide.
8. Allow to stand for 7 minutes.
9. Observe colour change by comparing with the standard colours of the test kits.

#### **Interpretation of results**

1. Change of the test paper to yellow-green to yellow colour indicates a safe level.
2. Change of the test paper to green colour indicates potential toxicity due to pesticides.
3. Change of the test paper to blue-green colour indicates high potential of toxicity due to pesticides.

#### **Report of Cholinesterase analysis results**

Normal - Cholinesterase level is equal to or greater than 100 units/ml.

Safe - Cholinesterase level is equal to or greater than 87.5 units/ml.

Possible risk - Cholinesterase level is equal to or greater than 75.0 units/ml.

Unsafe - Cholinesterase level is less than 75.0 units/ml.

**NOTE:** Analysis for plasma cholinesterase levels is used to indicate an exposure to anticholinesterase chemicals.

## **Appendix 2: Special herb formula recommended by the persons who succeeded in natural pest control applications.**

1. *Khun Saman Mudliad's formula:* Khun Saman was a farmer of Prik Sub-district, Sadaow District, Songkla Province. His formula below was used to control worms attacking underneath of Longong fruit skins:

### **Materials/ ingredients**

- |                            |       |                               |           |
|----------------------------|-------|-------------------------------|-----------|
| - Sliced citronella leaves | 2 Kgs | - Fresh mature margosa leaves | 2 Kgs     |
| - Sliced galingale roots   | 2 Kgs | - Clean water                 | 20 liters |
| - Plastic net              |       | - A basin                     |           |

### **Procedure**

1. Mix together sliced citronella leaves, margosa leaves, and sliced galingale roots and then crush until the solid mixture is as fine as possible.
2. Soak the ingredients in Step 1 in 20 liters of water and allow them to ferment over night
3. Filter the mixture through a fine net to remove the solid materials. Will obtain a concentrated liquid of approximately 20 liters.
4. Dilute 3 liters of the concentrated liquid with another 12 liters of water  
Spray on every 15-day basis.

2. *Khun Wat Makrudthong's formula*: Khun Wat was a farmer of Toongtumsao Sub-district, Hadyai District, Songkla Province. The following formula was used to control worms attacking underneath of Longong fruit skins:

### *Citronella fresh formula*

#### **Materials/ Ingredients**

- Sliced citronella leaves      10 Kgs
- Fresh mature margosa leaves    10 Kgs
- Sliced galingale roots      10 Kgs
- Clean water
- Plastic net
- A basin

#### **Procedure**

1. Mix sliced citronella leaves, margosa leaves, and sliced galingale roots together and then crush until the solid mixture is as fine as possible
2. Soak the ingredients in Step 1 in 20-30 liters of water and allow to sit for 3-5 days.
3. Filter the mixture through a fine net to remove the solid materials. Will obtain a concentrated liquid of approximately 20-30 liters.
4. For spray application, dilute 1 liter of the concentrated liquid with another 20 liters of water.



### *Citronella powder formula*

#### **Materials/ Ingredients**

- |                          |        |                   |                |
|--------------------------|--------|-------------------|----------------|
| - Citronella powder      | 3 Kgs  | - Margosa extract | 50 Tablespoons |
| - Sliced galingale roots | 10 Kgs | - Clean water     |                |
| - Plastic net            |        | - A basin         |                |

#### **Procedure**

1. Grind the sliced galingale roots into possible fine materials and then mix with the citronella powder.
2. Soak the ingredients in Step 1 in 60 liters of water and allow to ferment for 2 days.
3. Filter the mixture through a fine net to remove the solid materials. Will obtain a concentrated liquid of approximately 60 liters.
4. Mix 30 liters of the concentrated liquid with 50 tablespoons of margosa extract and 20 liters of water. Spray on every 7-day basis.

3. *Khun Unnop Tunsakul's formula*: Khun Unnop was a farmer of Klongluang District, Pratumthani Province. The following formula was used to control leave-miners and aphids in sweet oranges:

#### **Materials/ Ingredients**

- Citronella tree sliced (including leaves and stems) 3 Kgs
- Fresh mature margosa leaves (no stem) 4 Kgs
- Galingale roots sliced 4 Kgs
- Clean water 20 liters
- Plastic net - A basin
- An empty kerosene can - A knife
- A grinder

#### **Procedure**

1. Mix together the prepared ingredients of citronella, margosa, and galingale and then crush into possible fine materials.
2. Soak the mixture from Step 1 in water of 2-kerosine volume and allow to sit overnight.
3. Filter the mixture through a fine net to remove the solid materials. Will obtain a concentrated liquid of approximately 2 kerosine cans.
4. For spray application, dilute 1 liter of the concentrated liquid with another 40-60 liters of water.

**Appendix 3: Training courses by participatory learning for pesticide knowledge, attitudes, and practices of the farmers of Ban Hee, Moo 2 and 3, Khumjaroen Sub-district, Trakanphutphon District, Ubonratchathanee Province.**

**1. Training course by participatory learning**

No.	Components of PL	Specific Objectives	Contents	Activities	Materials	Speakers
1.	Introduction	<ul style="list-style-type: none"> <li>- To inform the features of the training program.</li> <li>- To build relationship between the participant and the speaker team.</li> </ul>	<ol style="list-style-type: none"> <li>1. Introducing the speakers and the participants.</li> <li>2. Introducing the project overview and the training schedule.</li> <li>3. Informing the objectives of the training program.</li> </ol>	Ice-breaking activities: <ul style="list-style-type: none"> <li>- Games</li> <li>- Songs</li> <li>- Self-introduction</li> </ul>	<ul style="list-style-type: none"> <li>- Documents</li> <li>- Handbooks</li> <li>- The training schedule</li> </ul>	<ul style="list-style-type: none"> <li>- Ms Nunta Srikhum</li> <li>- Mr. Terdkoon Pantakarn, the Public Health Office of Trakanphutphon District.</li> </ul>

No.	Components of PL	Specific Objectives	Contents	Activities	Materials	Speakers
2.	Experiential learning	<ul style="list-style-type: none"> <li>- To evaluate knowledge about pesticides and handling procedure.</li> <li>- To investigate the ideas and beliefs of the farmers about pesticide uses.</li> <li>- To investigate actual practices of the farmers when using and handling pesticides in their work.</li> </ul>	<ol style="list-style-type: none"> <li>1. Basic knowledge about important types or classes of pesticides.</li> <li>2. Knowledge about correct procedure for using and handling pesticide chemicals.</li> <li>3. Knowledge about the effects of pesticides on the environment.</li> <li>4. Experiences and background knowledge of the farmers about various aspects pesticide use.</li> <li>5. Actual pesticide routines and practices.</li> </ol>	<ul style="list-style-type: none"> <li>- Group discussion by setting up questions about knowledge, experiences, and actual practices.</li> <li>- Fieldwork observation of the farmers during their pesticide spraying application.</li> </ul>	<ul style="list-style-type: none"> <li>- Papers</li> <li>- Pencils</li> <li>- Questionnaires</li> </ul>	<ul style="list-style-type: none"> <li>- Ms Nunta Srikhum</li> <li>- Mr. Terdkoon Pantakarn, the Public Health Office of Trakanphutphon District, Ubonratchathani Province.</li> </ul>

No.	Components of PL	Specific Objectives	Contents	Activities	Materials	Speakers
3.	Reflection and discussion.	<ul style="list-style-type: none"> <li>- The farmers exchange ideas and opinions about pesticides, handling procedure, and their environmental effects.</li> <li>- For the farmers to develop self-awareness, to consider about others, and be responsible for the society.</li> <li>- The farmers understand and know the procedures and methods of natural plant extract applications for pest control</li> </ul>	<ol style="list-style-type: none"> <li>1. Theoretical Knowledge, methods and environmental effects of pesticides.</li> <li>2. The farmers' roles and functions in the surrounding society and in the environment within the community.</li> <li>3. Modern agricultural techniques without the use of pesticides for pest control but with the use of natural plant extracts.</li> </ol>	<ul style="list-style-type: none"> <li>- Group discussion sessions for sharing of opinions with supplementation of any incomplete knowledge from the trainers.</li> </ul>	<ul style="list-style-type: none"> <li>- Papers</li> <li>- Pens</li> <li>- Pencils</li> </ul>	<ul style="list-style-type: none"> <li>- Khun Uraiwan Ninpetch, the Department of Agriculture, Ubonratchathani University.</li> </ul>

No.	Components of PL	Specific Objectives	Contents	Activities	Materials	Speakers
4.	Conceptualisation	The farmers are able to conceptualise about correct knowledge, attitudes, and practices regarding pesticide handling and uses.	<ol style="list-style-type: none"> <li>1. Knowledge, methods, and effects of pesticide chemicals.</li> <li>2. Alternative non-chemical methods for pest control in vegetables.</li> <li>3. Advantages and disadvantages of pesticides and natural product applications for pest control.</li> </ol>	<ul style="list-style-type: none"> <li>- Viewing videos and summarizing pesticide knowledge and practices.</li> <li>- Group activities: to summarise the background knowledge and new knowledge gained about pesticides.</li> </ul>	<ul style="list-style-type: none"> <li>- Videos</li> <li>- Pencils</li> <li>- Papers</li> </ul>	<ul style="list-style-type: none"> <li>- Mrs. Udomluk Unjitwattana and colleagues, the Institute of Natural Product Technology Research and Development.</li> </ul>

No.	Components of PL	Specific Objectives	Contents	Activities	Materials	Speakers
5.	Experiment/ Application	<ul style="list-style-type: none"> <li>- The farmers are able to apply the knowledge gained in their work activities</li> <li>- The farmers repeatedly practice and hand-on experience with the equipments.</li> </ul>	<ol style="list-style-type: none"> <li>1. Illustrating alternative agricultural technology through use of natural extracts.</li> <li>2. Illustration of chemical safety and protective equipments.</li> </ol>	<ul style="list-style-type: none"> <li>- Group activities: to practice mixing and spraying pesticides wearing protective equipment and to compare the procedure with spraying application of natural plant extracts.</li> <li>- Fieldtrip to observe natural agricultural work at real sites.</li> </ul>	<ul style="list-style-type: none"> <li>- Illustration of alternate modern agriculture.</li> <li>- Illustration of safety and protective barriers.</li> </ul>	From the Agricultural Office of Trakanphutphon District.

## Appendix 4: Definition

**The participants/ the target populations** mean the populations with age of 15-65 years old, who lived in Ban Hee, Moo2 and 3, Khum-jareon Sub-district, Trakanphutphon District, Ubonratchathani Province and were vegetable farmers. After the recruitment process, there was 1 participant whose age was 66 years old, which older than the criterion range. He, however, was included the group of target populations.

**Pesticides** refer to chemicals used for control, prevention and elimination of living organisms that cause damages or annoyance to plants, animals, and humans.

**Organophosphates** are pesticide chemicals, which contain phosphorus as the main active group in killing insects. Organophosphate groups will inhibit the functions of Acetylcholinesterase enzyme leading to obstructive accumulation of Acetylcholine.

**Carbamates** are chemicals that are broadly toxic and rapidly degradable with low persistence in an environment. Their toxic effects are similar to those of organophosphate group. In addition, they are highly toxic to bees and fish.

**The participants' knowledge about pesticides** mean basic knowledge about pesticides such as types of chemicals, choice selection, storage, uses, health hazards, and disposal of used chemical containers.



**Attitudes** mean evaluative opinions and feelings about natural pest control methods regarding their advantages and disadvantages. Those attitudes strongly influence people' decision to support or reject the methods.

**Safety practices** mean the farmers' self-practices regarding pesticide uses and prevention of pesticide hazards.

## Appendix 5: Contamination of pesticides in environments

### Supplementary information:

Figure A.1 illustrates circulation of pesticides contaminated in the environment.

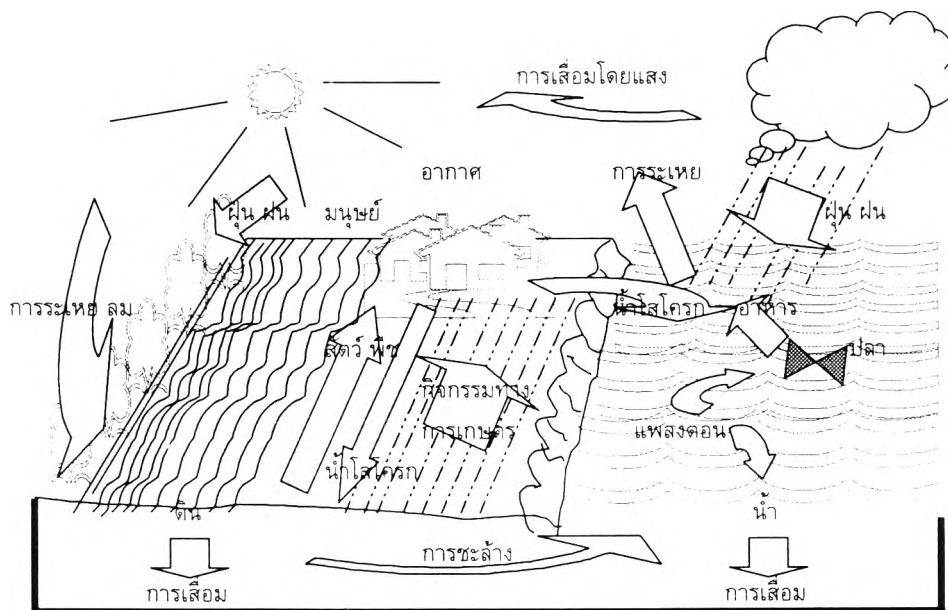


Figure A.1 Circulation of pesticides in the environment.

Contamination of pesticides in the environment occurs when pesticide chemicals used for agricultural activities are washed from their containers into water sources. Those chemicals will dissolve in the water and be accumulated in fish and other aquatic animals through a food chain. The chemicals can also cause deterioration of soil and water. Some chemicals will evaporate into the air producing air-pollution and some affecting plants and animals in the nearby areas.

Circulation of pesticide molecules in the air is often facilitated by water vapour and fine particles as their carriers. There may be co-distillation of the molecules with water vapour from the ground or water surfaces. Conversely, pesticide molecules may be brought back to the ground or to the surface water with rain and falling particles.

In soil, there is often accumulation of pesticides found at the surface of soil with approximately 1-2 inches in depth. Most of organochloride substances will be absorbed by soil particles and the process is mainly governed by activities of various microorganisms living in the soil. Therefore, any factors that enhance the growth development and the activities of the soil microorganisms will facilitate decomposition of the pesticides. Those factors included temperature, humidity, acidity, alkalinity, aeration, and quantity of organic materials.

In water, soil particles suspended in the water will accelerate and facilitate sedimentation process of the pesticide molecules. Levels of pesticides accumulated in the sediments of ponds, lakes, or rivers are, therefore, considerably higher than those in the water.

## Appendix 6: Questionnaires

No. of Questionnaires [ ] [ ]  
1 2

# Questionnaires

**Pesticide knowledge, attitudes, and practices of the vegetable farmers of Ban Hee,  
Moo 2 and 3, Khumjaroen Sub-district, Trakanphutphon District,  
Ubonratchathani Province Year 2000**

Name of interviewee: .....

Address: .....

Interviewer: .....

Interview date: .....

Interview time: .....

## General data

		For the author's use
1.	First name-Last name of interviewee:.....	
2.	Gender <input type="checkbox"/> Male <input type="checkbox"/> Female	[ ] 3
3.	Age <input type="checkbox"/> <input type="checkbox"/> Years old	[ ] [ ] 4 5
4.	Marital status <input type="checkbox"/> 1. Single <input type="checkbox"/> 2. Married <input type="checkbox"/> 3. Widowed <input type="checkbox"/> 4. Divorced/ Separated	[ ] 6
5.	Highest education level. <input type="checkbox"/> 0. None <input type="checkbox"/> 1. Primary School <input type="checkbox"/> 2. Junior High School <input type="checkbox"/> 3. Senior High School <input type="checkbox"/> 4. Diploma/ Graduate Certificate <input type="checkbox"/> 5. Bachelor Degree or higher	[ ] 7
6.	Duration of vegetable farming occupation. <input type="checkbox"/> 1. Less than 1 year. <input type="checkbox"/> 2. Between 1-2 years. <input type="checkbox"/> 3. More than 2 years.	[ ] 8
7.	Size of your current vegetable land. <input type="checkbox"/> 1. Not larger than 1 Rai. <input type="checkbox"/> 2. Between 1-2 Rais. <input type="checkbox"/> 3. Larger than 2 Rais.	[ ] 9
8.	You grow vegetables with a total of .....types.  Please specify .....  And grow vegetables.....times/ year.	
9.	How much is your approximate income per year? <input type="checkbox"/> 1. Less than 10,000 Baht. <input type="checkbox"/> 2. Between 10,000 – 20,000 Baht. <input type="checkbox"/> 3. Between 20,001 – 30,000 Baht. <input type="checkbox"/> 4. More than 30,000 Baht. <input type="checkbox"/> 5. Other (please specify) .....	[ ] 10

10. Frequency of pesticide spraying application per week.

- 1. Once
- 2. Twice
- 3. Three times
- 4. Four times

[ ]  
11

11. The result of your last blood test for chemical contamination.

- 1. Normal
- 2. Safe
- 3. Potential risks
- 4. Unsafe

[ ]  
12

12. You spend money for pesticides .....Baht per year.

### Data on knowledge about pesticides

- |  |                   |
|--|-------------------|
| <p>1. Knowledge sources where you have gained information about pesticides.</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 1. Asking neighbours.</li> <li><input type="checkbox"/> 2. Advice from the shop/ the seller.</li> <li><input type="checkbox"/> 3. From radio/television shows.</li> <li><input type="checkbox"/> 4. From related documents and printed media.</li> <li><input type="checkbox"/> 5. Read the label on the side of the chemical container.</li> <li><input type="checkbox"/> 6. Advice from governmental officials.</li> </ul> | <p>[ ]<br/>13</p> |
| <p>2. How to select proper choice of pesticides?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 1. Low cost.</li> <li><input type="checkbox"/> 2. Commonly available for sale.</li> <li><input type="checkbox"/> 3. Buy according to your neighbours' recommendation.</li> <li><input type="checkbox"/> 4. Choose to match with types of insects/ unwanted plants.</li> </ul>   | <p>[ ]<br/>14</p> |
| <p>3. What should you do if the label of the prolonged storage pesticides fades or is unclear?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 1. Use as normal.</li> <li><input type="checkbox"/> 2. Use more pesticide than usual.</li> <li><input type="checkbox"/> 3. Should not use the chemical.</li> <li><input type="checkbox"/> 4. Dispose into a water source.</li> </ul>  | <p>[ ]<br/>15</p> |
| <p>4. How important are labels enclosed with pesticide containers?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 1. For people to use the chemical correctly.</li> <li><input type="checkbox"/> 2. To inform which company manufacture the chemical.</li> <li><input type="checkbox"/> 3. To inform what type of insects can be killed by the chemical.</li> <li><input type="checkbox"/> 4. To inform the ingredients of the chemical.</li> <li><input type="checkbox"/> 5. Do not know.</li> </ul>   | <p>[ ]<br/>16</p> |
| <p>5. How do you mix pesticide chemicals?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 1. Mix more pesticide than indicated on the label.</li> <li><input type="checkbox"/> 2. Mix less pesticide than indicated on the label.</li> <li><input type="checkbox"/> 3. Mix as indicated on the label.</li> <li><input type="checkbox"/> 4. Mix as one like.</li> </ul>   | <p>[ ]<br/>17</p> |
| <p>6. How do pesticides enter the body?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 1. Through the mouth, forchands, and forefeet.</li> <li><input type="checkbox"/> 2. Through the nose, the mouth, and fingernails.</li> <li><input type="checkbox"/> 3. Through the mouth, the nose, and hairs.</li> <li><input type="checkbox"/> 4. Through the nose, the mouth, and the skin.</li> </ul>  | <p>[ ]<br/>18</p> |
| <p>7. May a person who never practices pesticide applications be exposed to pesticides? By what means?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> 1. No, as the person does not handle the chemicals.</li> <li><input type="checkbox"/> 2. No, as the chemicals can only enter the body during spraying.</li> <li><input type="checkbox"/> 3. Yes, through sharing of general belongings.</li> <li><input type="checkbox"/> 4. Yes, through ingestion of contaminated fruits and vegetables.</li> </ul>   | <p>[ ]<br/>19</p> |

8. What diseases are resulted from prolong accumulation of pesticides in the body? [ ]  
20
- 1. AIDS
  - 2. Cancers
  - 3. Pneumonia
  - 4. Tuberculosis
  - 5. Nothing will occur.
9. How long after pesticide spray application before you think you can harvest the vegetables? [ ]  
21
- 1. Immediately
  - 2. One day
  - 3. Three days
  - 4. Five days
  - 5. Seven days
  - 6. As recommended on the label.
10. What types of plants can be used to control insects? [ ]  
22
- 1. Pandanus leaves and crinum.
  - 2. Citronella leaves and margosa.
  - 3. Lemon and lime leaves.
  - 4. No plant could be used for pest control.
11. What should you do if you find pesticides contamination in your blood? [ ]  
23
- 1. Ask for advice from public health officers.
  - 2. Take cautions in handling and using pesticide chemicals.
  - 3. Discontinue using pesticide chemicals.
  - 4. Do nothing, as there is no illness sign.



**Data on farmer's attitudes towards natural pest control methods**

Attitudes	Agree	Unsure	Disagree	
1. Pest control relies on only pesticide application.				[   24
2. Pesticide sprays, low or high quantity, can be harmful to the users.				[   25
3. A person who never practices pesticide spraying may be harmed by pesticides through consumption of contaminated vegetables and fruits.				[   26
4. Natural pest control methods such as applications of margosa and citronella could produce vegetables that are safe for consumption.				[   27
5. Vegetables and agricultural products from non-pesticide process are not favored in the market as they are not attractive and have insect bitten marks.				[   28
6. Fruits and vegetables resulted from uses of natural pest control methods are as tasty as those resulted from uses of pesticides in the production process.				[   29
7. Natural pest control methods are difficult and time consuming.				[   30
8. Consumers should buy chemical free fruits and vegetables.				[   31
9. At present, uses of pesticides for pest control cause problems to human health and to environments.				[   32
10. If there are products of pest control herbs for sale in your community, you will purchase and use them for pest control				[   33
11. Pesticide chemicals contaminated in soil and in water sources can be harmful to animals living in the soil and the water.				[   34
12. Farmers use natural pest control methods for the safety of both the farmers and the product consumers.				[   35

### Data on pesticide practices

Practices	Regularly	Occasionally	Never	
1. Read instruction labels on pesticide containers every time before use.				36
2. Wear protective barriers such as gloves, nose mask, hat, safety glasses, long-sleeve shirts, trousers, and covered shoes every time during pesticide spraying.				37
3. Prepare chemicals in spraying containers and mix well using a wood stick every time before use.				38
4. You smoke or chew food for soothing and relaxing purposes during chemical spraying.				39
5. Clean chemical containers after use and keep them out of reach of children and away from animal enclosures.				40
6. Prepare several types of chemicals in the same container for fast and convenient process and to reduce numbers of preparation and spraying steps.				41
7. Wash used chemical containers and spraying equipment into rivers and streams, as it is easy and convenient.				42
8. Spraying chemicals during cool weather is better than spraying during hot weather.				43
9. During spraying, should stand at the head of the wind to prevent spread of chemical sprays onto the body.				44
10. After spraying chemicals, should clean up your body, hair, and clothes immediately.				45
11. Chemicals not in use should be stored in a safe place, separated from food and drink storage. They should also be kept out of reach of children.				46
12. Take cautions during chemical spraying to prevent spill of the chemicals and splash onto the body.				47
13. When the chemicals are spilled on the floor, soil or wood shavings are used to absorb the spill, and then land-filled away from residential areas.				48
14. After spraying application of each chemical type, place a sign indicating the spraying date and predetermined date for harvesting.				49
15. Landfill empty chemical bottles and used containers.				50

## CURRICULUM VITAE

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**Education Background:**

1999-Present      Undertaking Master of Public Health, College  
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1993                Bachelor of Public Health, Khon Kaen  
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1983                Midwifery and Nursing Certificate,  
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