# CHAPTER 3

# PROJECT EVALUATION

## 3.1 Introduction

The project evaluation was divided into 4 phases as follows:

**Phase 1: Baseline**

This phase involved collection of baseline data on demographical details, knowledge, attitudes, and pesticide practice as well as conducting blood tests for evaluation of the participants prior to participatory learning program.

**Phase 2: Training program by participatory learning**

The training program by participatory learning was organized for the studied group. The 6-day program was structured into 3 sessions with 2-day duration each. The training process was evaluated by analysis of training contents, the appropriateness of training for the participants, timing, and resource allocation through observation and informal interview with the participants and the trainers.

**Phase 3: Follow up**

Three follow up sessions with 2-month interval were conducted to evaluate knowledge, attitudes, and pesticide handling and practice of the participants. Data were obtained through collection of qualitative data, interview, and observation.

**Phase 4: Post-intervention at 6 months after training**

A single post-evaluation session was conducted at 6 months after the training program by participatory learning to compare post-training data with the baseline. The process involved post-test evaluation by the same set of questionnaires as for the pre-test and blood tests.

## 3.2 Phase 1 Evaluation: Baseline

**Purposes**

1. To evaluate knowledge, attitudes, and pesticide practice of the participants before training program by participatory learning.
2. To assess chemical levels in blood samples of the participants before training for comparison with post-training results.

**Evaluation questions**

1. What were the knowledge, attitudes, and pesticide practices of the participants before the training?
2. What were the blood test results of the participants before the training?

**Evaluation design**

1. Pre-evaluation of the participants' knowledge, attitudes, and pesticide practices was conducted for the 50 studied populations at 1month prior to implementation education program using the pre-test questionnaires.
2. Outcome measurements were:
   - Background information on socio-economic status.
   - Mean scores of knowledge, attitudes, and pesticide practices.
3. Data collection instrument

An instrument employed for data collections was the questionnaire, which consisted of four parts: general data, knowledge about pesticides, attitudes towards applications of pesticides and herbal plants for pest control purposes, and data on pesticide practices. The number of the questionnaires was 50 copies equal to the number of participants.

**Part 1:** General data contained a total of 12 questions on names, gender, age, marital status, highest education level, duration in vegetable-growing occupation, sizes of vegetable land, types of vegetables grown, cultivation frequency per year, income from vegetable production per year, frequency of pesticide application per week, expenses of pesticides per year, and the result of the blood test before training.

**Part 2:** Data on knowledge about pesticides contained a total of 11 multiple-choice questions requiring the participants to choose only one best answer. The questions covered topics on participants' information sources, chemical storage, mixing

of chemicals, hazards to the users in case of incorrect uses, and applications of herbal plants for insect control.

**Part 3:** Attitudes towards applications of pesticides and herbal plants for pest control purposes contained a total of 12 questions which required the participants to choose one of the three given answers, namely, "agree", "disagree", and "unsure". The scoring of each item is given as follows:

| | | |
|---|---|---|
| Agree | given | 2 scores |
| Unsure | given | 1 score |
| Disagree | given | 0 score |

**Part 4:** Data on pesticide practices of the participants contained a total of 15 questions on pesticide handling and practices including selection of pesticide storage, mixing, spraying, time of spraying application, cleaning of the chemical containers after use, behaviours during spraying application, and use of protective barriers from pesticides. The participants were to choose one answer from "practice", "occasionally practice", and "never practice". The scoring method was as follows:

| | | |
|---|---|---|
| Practice | given | 2 scores |
| Occasional practice | given | 1 score |
| Never practice | given | 0 score |

4. Results

The SPSS version 10.0.1 for Windows 98 was employed for data analysis

Table 3.1 showed general data classified by gender, age, marital status, education background, duration of vegetable-growing occupation, sizes of vegetable land, types of vegetables grown, average family income per year, frequency of pesticide application per week, cost of pesticides per year.

**Table 3.1: General data classified by gender, age, marital status, education background, duration of vegetable-growing occupation, sizes of vegetable land, types of vegetables grown, average family income per year, frequency of pesticide application per week, cost of pesticides per year.**

| Variables | Number of population | Percentage |
|---|---|---|
| Gender | | |
| Male | 16 | 32 |
| Female | 34 | 68 |
| Total | 50 | 100 |
| Age (year) | | |
| < 30 | 7 | 14 |
| 31-35 | 8 | 16 |
| 36-40 | 7 | 14 |
| 41-45 | 10 | 20 |
| 46-50 | 6 | 12 |
| 51-55 | 8 | 16 |
| >55 | 4 | 8 |
| Total | 50 | 100 |
| Marital status | | |
| Single | 5 | 10 |
| Married | 42 | 84 |
| Widowed | 2 | 4 |
| Divorced | 1 | 2 |
| Total | 50 | 100 |
| Educational background | | |
| Primary | 47 | 94 |
| Early secondary | 3 | 6 |
| Total | 50 | 100 |
| Duration of vegetable farming occupation | | |
| Less than 1 year | 9 | 18 |
| 1-2 years | 4 | 8 |
| More than 2 years | 37 | 74 |
| Total | 50 | 100 |

**Table 3.1: General data classified by gender, age, marital status, education background, duration of vegetable-growing occupation, sizes of vegetable land, types of vegetables grown, average family income per year, frequency of pesticide application per week, cost of pesticides per year (continued).**

| Variables | Number of population | Percentage |
|---|---|---|
| Sizes of vegetable land | | |
| Less than 1 Rai | 14 | 28 |
| 1-2 Rais | 22 | 44 |
| Larger than 2 Rais | 14 | 28 |
| Total | 50 | 100 |
| Number of vegetable types | | |
| 1 type | 8 | 16 |
| 2 types | 12 | 24 |
| 3 types | 12 | 24 |
| 4 types | 7 | 14 |
| 5 types | 10 | 20 |
| 8 types | 1 | 2 |
| Total | 50 | 100 |
| Average family income per year (Baht) | | |
| Less than 10,000 | 34 | 68 |
| 10,000 – 20,000 | 12 | 24 |
| 20,001 – 30, 000 | 2 | 4 |
| More than 30,000 | 2 | 4 |
| Total | 50 | 100 |
| Frequency of pesticide application per week | | |
| Once | 38 | 76 |
| Twice | 5 | 10 |
| 4 times | 7 | 14 |
| Total | 50 | 100 |
| Cost of pesticides (Baht per annum ) | | |
| Less than 100 | 3 | 6 |
| 101-300 | 18 | 36 |
| 301-500 | 17 | 34 |
| 501-700 | 7 | 14 |
| More than 700 | 5 | 10 |
| Total | 50 | 100 |

## 1. General data

*Gender*

- There were 68 % female participants and 32 % male participants.

*Age*

- There was one participant with the oldest age of 66 year old and one youngest participant at 22 years of age. The majority of the participants were between 41-45 years of age. The mean age was 42 with the Standard Deviation of 10.42.

*Marital status*

- The majority of the participants were married (84%). The next groups in rank were single (10 %), widow (4%), and divorced (2%) respectively

*Highest education level*

- The highest education level of the majority of the participants was at primary school level accounting for 94% of the total populations. There was 6 % of the participants completed secondary school education.

*Vegetable farming duration*

- The majority of the participants had been growing vegetables for more than 2 years, accounting for 74 % of the total populations. The next groups in rank were "less than 1 year" (18 %), and "between 1-2 years" (8%) (Minimum = 1 and Maximum = 3).

*Size of the current vegetable land*

- The majority of the participants (44%) grown vegetables in 1-2 Rais. The next groups were "less than 1 Rai" and "more than 2 Rais", both with 28% of the total populations (Minimum = 1and Maximum = 3).

*Number of vegetable types grown*

- The majority of the participants (48%) grew 2 and 3 types of vegetables. The next ranking groups included 5 types (20%), 1 type (16%), and 4 types (14%) respectively. The least group was 8 types accounting for only 2% of the total populations.

*Average family income per year*

- An average family annual income of the majority of the participants (68%) was 10,000 Baht. The next groups in rank were incomes between 10,000-20,000 Baht (24%), between 20,001-30,000 Baht (4%), and more than 30,000 Baht (4%) respectively.

*Frequency of pesticide applications per week*

- The majority of the participants (76%) sprayed pesticides once per week. Other frequency groups in the rank were 4 times per week (14%) and twice per week (10%) respectively.

*Costs of pesticides per year*

- The costs spent by the participants for pesticides each year were minimum 50 Baht and maximum 1,500 Baht. The average cost for pesticides per year was 422.60 Baht. The cost spent by the majority of participants for pesticide each year were 101-300 Bath, which was about 36% of their incomes.

Table 3.2 showed comparison between numbers of vegetable types with frequency of pesticide applications per week. It was found that the frequency of pesticide applications did not increase with numbers of vegetable types grown. However, the frequency of 1 application per week was a common practice for 38 participants who grew from 1 type to 8 types of vegetables.

**Table 3.2: Comparison between numbers of vegetable types with frequency of pesticide applications per week.**

| | | Number of vegetable types grown | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency of pesticide applications per week | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Total |
| | 1 | 6 | 6 | 11 | 5 | 9 | 0 | 0 | 1 | 38 |
| | 2 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 5 |
| | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 4 | 0 | 6 | 0 | 0 | 1 | 0 | 0 | 0 | 7 |
| | Total | 8 | 12 | 12 | 7 | 10 | 0 | 0 | 1 | 50 |

**2. Data on knowledge, attitudes, and pesticide practice**

- There were 11 questions for evaluation of knowledge about pesticides.
- There were 12 questions for evaluation of attitudes towards applications of pesticides and herbal plants for pest control.
- There were 15 questions for evaluation of pesticide handling and practice.

Table 3.3 illustrates the knowledge of participants prior to training, which indicated that:

- The participants had least knowledge about Items 1-5: knowledge about pesticide application and practice with equal numbers of correct answers and incorrect answers
- Items 6, 8, and 11 covered the knowledge about effects of pesticides on human health. The majority of the participants was aware of the means for pesticides to enter the body but did not know their health hazards.
- Item 9 covered safety chemical level in consumable vegetables. Knowledge of the majority of the participants was found to be inadequate with 86 % of incorrect answers and only 14 % of correct answers.
- Item 10 covered the knowledge about applications of herbal plants for insect control. The majority of the participants knew types of plants that can be used for insect control with 94 % of correct answers and only 6% of incorrect answers.

**Table 3.3: Results of the knowledge evaluation of the participants before training classified by item.**

| No. | Questions | Correct | | Incorrect | |
|---|---|---|---|---|---|
| | | n | % | n | % |
| 1. | Knowledge sources where you have gained knowledge about pesticides. | 28 | 56 | 22 | 44 |
| 2. | How to select pesticides? | 22 | 44 | 28 | 56 |
| 3. | What should you do if the label of the prolonged storage pesticides fades or is unclear? | 37 | 74 | 13 | 26 |
| 4. | How important are labels enclosed with pesticide containers? | 26 | 52 | 24 | 48 |
| 5. | How do you mix pesticide chemicals? | 21 | 42 | 29 | 58 |
| 6. | How do pesticides enter the body? | 41 | 82 | 9 | 18 |
| 7. | By what means may persons who never practice pesticide application be exposed to pesticides? | 41 | 82 | 9 | 18 |
| 8. | What diseases are resulted from prolong accumulation of pesticides in the body? | 28 | 56 | 22 | 44 |
| 9. | How long after pesticide spray application you think you can harvest the vegetables? | 7 | 14 | 43 | 86 |
| 10. | What types of plants can be used to control insects? | 47 | 94 | 3 | 6 |
| 11. | What should you do if you find pesticides contamination in your blood? | 10 | 20 | 40 | 80 |

Table 3.4 indicated that:

- Items 1-3, 9, and 11 covered the farmers' attitudes about pesticides. The majority of the participants had knowledge about effects or harms of pesticides.
- Item 4-8, 10, and 12 covered attitudes about natural pest control methods. The majority of the participants had correct believes about natural pest control methods.

**Table 3.4: Participants' attitudes towards pesticide application before training classified by items.**

| No. | Questions | Agree | | Unsure | | Disagree | |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % |
| 1. | Pest control relies on only pesticide application. | 16 | 32 | 8 | 16 | 26 | 52 |
| 2. | Pesticide sprays, low or high quantity, can be harmful to the users. | 46 | 92 | 1 | 2 | 3 | 6 |
| 3. | A person who never practices pesticide spraying may be harmed by pesticides through consumption of contaminated vegetables and fruits. | 44 | 88 | 3 | 6 | 3 | 6 |
| 4. | Natural pest control methods such as applications of margosa and citronella could produce vegetables that are safe for consumption. | 47 | 94 | 2 | 4 | 1 | 2 |
| 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. | 43 | 86 | 0 | 0 | 7 | 14 |
| 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. | 36 | 72 | 10 | 20 | 4 | 8 |

**Table 3.4: Participants' attitudes towards pesticide application before training classified by items (continued).**

| No. | Questions | Agree | | Unsure | | Disagree | |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % |
| 7. | Natural pest control methods are difficult and time consuming. | 9 | 18 | 2 | 4 | 39 | 78 |
| 8. | Consumers should buy chemical free fruits and vegetables. | 42 | 84 | 2 | 4 | 6 | 12 |
| 9. | At present, uses of pesticides for pest control cause problems to human health and to environments. | 46 | 92 | 1 | 2 | 3 | 6 |
| 10. | If there are products of pest control herbs for sale in your community, you will purchase and use them for pest control | 46 | 92 | 3 | 6 | 1 | 2 |
| 11. | Pesticide chemicals contaminated in soil and in water sources can be harmful to animals living in the soil and the water | 46 | 92 | 3 | 6 | 2 | 4 |
| 12. | Farmers use natural pest control methods for the safety of both the farmers and the product consumers. | 49 | 98 | 0 | 0 | 1 | 2 |

Table 3.5 showed pesticide practices of the participants. Item 2 and 4 covered the practice that could affect the user's health. They were found to have comparable percentages (approximately half-half) of correct and incorrect scores, which indicated unawareness of the participants in protecting themselves from pesticides during practice. Item 7 covered pesticide practice with environmental concern. The participants were found to be considerably unaware of the environmental effects caused by pesticides with similarly comparable percentages of correct and incorrect scores. Item 14 covered placing of a sign indicating the spraying and suitable harvesting dates

after pesticide spraying. It was found that the participants yet lacked of awareness to practice this item with 66 % of never practice participants and only 22% of practiced participants.

**Table 3.5: Pesticide practices of the participants before training classified by items.**

| No. | Questions | Regularly | | Occasionally | | Never | |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % |
| 1. | Read instruction labels on pesticide containers every time before use. | 28 | 76 | 9 | 18 | 3 | 6 |
| 2. | Wear protective barriers such as gloves, a nose mask, hat, safety glasses, long-sleeve shirts, trousers, and covered shoes every time during pesticide spraying. | 24 | 48 | 19 | 38 | 7 | 14 |
| 3. | Prepare chemicals in spraying containers and mix well using a wood stick every time before use. | 43 | 86 | 5 | 10 | 2 | 4 |
| 4 | You smoke or chew food for soothing and relaxing purposes during chemical spraying. | 29 | 58 | 1 | 2 | 20 | 40 |
| 5. | Clean chemical containers after use and keep them out of reach of children and away from animal enclosures. | 45 | 90 | 0 | 0 | 5 | 10 |
| 6. | Prepare several types of chemicals in the same container for fast and convenient process and to reduce numbers of preparation and spraying steps. | 21 | 42 | 2 | 4 | 27 | 54 |
| 7. | Wash used chemical containers and spraying equipment into rivers and streams, as it is easy and convenient. | 25 | 50 | 5 | 10 | 20 | 40 |
| 8. | Spraying chemicals during cool weather is better than spraying during hot weather. | 45 | 90 | 4 | 8 | 1 | 2 |

**Table 3.5: Pesticide practices of the participants before training classified by items (continued).**

| No. | Questions | Regularly | | Occasionally | | Never | |
|---|---|---|---|---|---|---|---|
| | | n | % | n | % | n | % |
| 9. | During spraying, should stand at the head of the wind to prevent spread of chemical sprays onto the body. | 48 | 90 | 1 | 2 | 1 | 2 |
| 10. | After spraying chemicals, should clean up your body, hair, and clothes immediately. | 43 | 86 | 6 | 12 | 1 | 2 |
| 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. | 47 | 94 | 2 | 4 | 1 | 2 |
| 12. | Take cautions during chemical spraying to prevent spill of the chemicals and splash onto the body. | 45 | 90 | 3 | 6 | 2 | 4 |
| 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. | 45 | 90 | 4 | 8 | 1 | 2 |
| 14. | After spraying application of each chemical type, place a sign indicating the spraying date and predetermined date for harvesting. | 11 | 22 | 6 | 12 | 33 | 66 |
| 15. | Landfill empty chemical bottles and used containers. | 37 | 74 | 4 | 8 | 9 | 18 |

Table 3.6 indicates the results of the blood test for chemical contamination level in the participants before intervention program. It was found that percentages of the participants with chemical contaminated in blood at potential risk level and at unsafe level were 50 % and 6.0 % respectively.

**Table 3.6: Participants' blood test results by reactive paper techniques.**

| Blood test results | Number | % |
|---|---|---|
| Normal | 10 | 20 |
| Safe | 12 | 24 |
| Potential risks | 25 | 50 |
| Unsafe | 3 | 6 |
| **Total** | **50** | **100** |

## 3.3 Phase 2 Evaluation: Training program by participatory learning

### Purpose

To evaluate process of the training program by participatory learning

### Evaluation questions

1. How were the resources used for the training program?
2. Was the 6-day intensive training program appropriate to deliver the content?
3. Was the program beneficial?
4. Were the problems and obstacles of the program identified?
5. Was the venue suitable for learning?

### Evaluation design

1. Outcome measurement was:

- Evaluating consistency of the actual training program with the training schedule and the activity plan.

2. Data collection instruments
   - Observation.
3. When to measure?
   - During the training sessions.
   - At the end of the training program
4. Who to measure?
   - The project manager.

**Results**

The project manager conducted comparative analysis of the resources such as manpower, budget, material, and time, and found to be sufficiently and effectively used in this project. The data is shown in Table 3.7.

**Process evaluation of the project**

*1. Activity* - Consistent with the set objectives
- Contents and learning activities were appropriate and well organized.

**Table 3.7: Comparison of resource allocation with the project plan and schedule.**

| Resource allocation | Planned | Actual | Discrepancy |
|---|---|---|---|
| Manpower | 6 persons | 8 persons | +2 persons |
| Money | 43,920 Baht | 20,000 Baht | - 23,920 Baht |
| Material | Sufficient | Sufficient | n/a |
| Time | 10 days | 6 days | - 4 days |

2. ***Timing*** - The program comprised of three training sessions, each of 2-day duration so with a total of 6 days. The duration was appropriate and consistent with the training contents. The longer duration would cause problems with attendance of the target participants, as they had to work for living. The project organizer allowed an appropriate period of time between each session so that every participant was available to attend the group activities.

**Evaluation of the learning process**

Learning contents on knowledge, attitudes, and skills for pesticide practice provided in the training could not be separated into clear topics as some parts of those three aspects were interrelated and could be learned at the same time.

The first training session covered general knowledge about groups of pesticides from the past experiences of the participants and knowledge about correct procedure for pesticide practice.

- The participants showed high levels of interest and cooperated in answering questions and expressing opinions.
- The participants were enthusiastic in joining small group activities.
- There was sharing of experiences in pesticide practice among the participants.
- The presentation of the group opinions on each topic was well conducted and interesting. There were also extensive questioning and discussion.

**Outcomes**

1. The participants could learn effectively by participatory process. Every participant was able to give opinions when being encouraged by the speaker team. Most participants were in working age groups with little age difference; therefore were dexterous with participation in the activities.
2. Interviewing with the participants found that they liked participatory training as every person could give opinions, so was not bored and sleepy.
3. There were three sessions of the training program with relocation of the venues for more excitement and interests. There was also a fieldwork observation outside the training venue. Interviewing and observation of the participants found high levels of participants' interest in joining the activities, as every participant was present and arrived early on the day of the fieldtrip.
4. Another supporting factor for running the training program:

- Home-picked up transportation for the fieldtrip provided convenience for the participants so they cooperated well in the activities.

## 3.4 Phase 3 Evaluation: Follow up visits

**Purpose**

To analyse and evaluate the follow up visits to the participants.

**Evaluation questions**

1. How was the process of the group meeting? Was it successful?
2. Were problems and obstacles of the group meeting identified?
3. How did the knowledge, attitudes, and practice of the participants change after the participatory training program?

**Evaluation design**

1. Outcome measurements:
   1.1 Evaluating consistency of the group meeting contents.
   1.2 Evaluating the process of the follow up visits.
   1.3 Evaluating knowledge, attitudes, and practices during each meeting session at 2 months, 4 months, and 6 months after the training to supplement any inadequate materials.
2. Data collection instruments:

- In-depth interview and record about the training materials and then evaluate knowledge, attitudes, and practices for signs of improvement.
- Observation at the houses and the fields of the participants to randomly check if their pesticide practices had been improved in correct direction.

**Results**

It was found that the follow up visits could evaluate knowledge, attitudes, and practices after the participatory training. Through observation and record of the project organizer team, the participants were found to have better knowledge, more correct attitudes, and more correct pesticide practices.

Pesticide related topics brought up for discussion during the follow up meetings included:

- Mixing of pesticide chemicals.
- Means for pesticides could enter the body.
- Hazards of pesticide chemicals.
- Herbal plants used for pest control.

The majority of the participants were found to answer questions correctly. There were some participants who misunderstood about mixing of chemicals. The investigator then explained additional materials for the missing parts.

Evaluation of the participants' attitudes towards applications of pesticide and herbal plants for pest control purposes was conducted through interviewing and discussion with the participants. Results were that participants paid more attention to applications of herbal plants. From random observation of the house gardens and vegetable fields of every participant, there was growing of citronella, which received supports from the Department of Agriculture, Ubonratchathani University. From field observation of 15 participants, the 3 original citronella sprouts received were largely reproduced into several clusters with several of additional transplanting. There was also growing of margosa around the vegetable garden and the yard areas.

After the training program, follow-up visits were conducted at 3 different intervals, i.e., at 2, 4 and 6 months. At these follow-up visits, the investigator observed the participants' activities in pesticide handling and uses and provided reinforcement in proper pesticide management. Due to time and resource limitation, a sample of 10 participants was selected for the follow-up visits.

Table 3.8 illustrates the results of the use of protective gear and practices of 10 participants. Five used all four recommended protective gears after the training program and continued the usage up to the third follow-up visit. Among the other five who either failed to protect themselves totally or partially, a trend in improvement in the usage of protective gear is seen from the first follow-up to the third follow-up visit. At the first follow-up visit, 2 participants didn't wear any of the 4 recommended protective gears. By the third follow-up visit, most used all but one protective gear, that is, rubber gloves.

**Table 3.8: Pesticide practices of the participants after training program 2, 4 and 6 month**

| | Follow-up visits 1 {2 month} | Follow-up visits 2 {4 month} | Follow-up visits 3 {6 month} |
|---|---|---|---|
| Case 1 | Did not wear hat and rubber gloves | Did not wear rubber gloves | Not found |
| Case 2 | Did not wear hat, shoes, rubber gloves and nose-mouth masks | Did not wear shoes , rubber gloves | Did not wear rubber gloves |
| Case 3 | Did not wear hat, shoes, rubber gloves and nose-mouth masks | Did not wear rubber gloves and nose-mouth masks | Did not wear rubber gloves |
| Case 4 | Did not wear hats and rubber gloves | Not found | Did not wear rubber gloves |
| Case 5 | Did not wear hat, rubber gloves and nose-mouth masks | Did not wear rubber gloves and nose-mouth masks | Did not wear nose-mouth masks |
| Case 6 | wear hat, shoes, rubber gloves and nose-mouth masks | wear hat, shoes, rubber gloves and nose-mouth masks | wear hat, shoes, rubber gloves and nose-mouth masks |
| Case 7 | wear hat, shoes, rubber gloves and nose-mouth masks | wear hat, shoes, rubber gloves and nose-mouth masks | wear hat, shoes, rubber gloves and nose-mouth masks |
| Case 8 | wear hat, shoes, rubber gloves and nose-mouth masks | wear hat, shoes, rubber gloves and nose-mouth masks | wear hat, shoes, rubber gloves and nose-mouth masks |
| Case 9 | wear hat, shoes, rubber gloves and nose-mouth masks | wear hat, shoes, rubber gloves and nose-mouth masks | wear hat, shoes, rubber gloves and nose-mouth masks |
| Case 10 | wear hat, shoes, rubber gloves and nose-mouth masks | wear hat, shoes, rubber gloves and nose-mouth masks | wear hat, shoes, rubber gloves and nose-mouth masks |

## 3.5 Phase 4 Evaluation: Post-intervention (at 6 months after training)

### Purpose

1. To evaluate knowledge, attitudes, and pesticide handling and practices of the participants after the training.
2. To conduct blood tests for chemical contamination levels in the participants after the training for comparison with the pre-training results.

### Evaluation questions

1. What were the knowledge, attitudes, and pesticide practices of the participants after the participatory training? Were they different from the pre-training data?
2. What were the results of the blood tests for chemical contamination levels in the participants after the participatory training? Were there any differences between pre- and post-training results?

### Evaluation design

1. Comparing knowledge, attitudes, and pesticide practices of the participants before and after the training by participatory learning.
2. Comparing the blood test results of the participants before and after the participatory training.
3. Outcome measurements

- Mean score of knowledge, attitudes, and practices before and after the training.

4. Data collection instruments
   - The questionnaires for evaluation of knowledge, attitudes, and practices before and after the training.
5. Results

The SPSS version 10.0.1 for Windows data analysis was used to analyse the data.

Table 3.9 indicated that the mean scores of the participants' knowledge for items 2, 5, 9, and 11 before training were relatively low with domination of incorrect scores. Comparison of the pre- and post- training mean scores within each knowledge item found that there was an increase in percentage of correct answers in items 2, 5, and 9. However, there was a decrease in that of item 11 from 20 % of correct scores before training down to 10 % of correct scores after training.

**Table 3.9: Comparison of the mean scores of the participants' knowledge before and after training classified by items.**

| No. | Questions | Baseline | | | | Post-intervention | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Correct | | Incorrect | | Correct | | Incorrect | |
| | | n | % | n | % | n | % | n | % |
| 1. | Knowledge sources where you have gained knowledge about pesticides? | 28 | 56 | 22 | 44 | 16 | 32 | 34 | 68 |
| 2. | How to select pesticides? | 22 | 44 | 28 | 56 | 44 | 88 | 6 | 12 |
| 3. | What should you do if the label of the prolonged storing pesticides fades or is unclear? | 37 | 74 | 13 | 26 | 48 | 96 | 2 | 4 |
| 4. | How important are labels enclosed with pesticide containers? | 26 | 52 | 24 | 48 | 41 | 82 | 9 | 18 |
| 5. | How do you mix pesticide chemicals? | 21 | 42 | 29 | 58 | 47 | 94 | 3 | 6 |
| 6. | Through what means do pesticides enter the body? | 41 | 82 | 9 | 18 | 48 | 96 | 2 | 4 |
| 7. | By what means may persons who never practice pesticide application be exposed to pesticides? | 41 | 82 | 9 | 18 | 48 | 96 | 2 | 4 |
| 8. | What diseases are resulted from prolong accumulation of pesticides in the body? | 28 | 56 | 22 | 44 | 41 | 82 | 9 | 18 |
| 9. | How long after pesticide spray application you think you can harvest the vegetables? | 7 | 14 | 43 | 86 | 49 | 98 | 1 | 2 |
| 10. | What types of plants can be used to control insects? | 47 | 94 | 3 | 6 | 50 | 100 | 0 | 0 |
| 11. | What should you do if you find pesticides contamination in your blood? | 10 | 20 | 40 | 80 | 5 | 10 | 45 | 90 |

From Table 3.10, it was found that there was a highest proportion of the agree answer (98%) for the following items: spraying application of pesticides with small or large quantity could be harmful to the users, persons who never practiced pesticide spraying might be exposed to the chemicals through ingestion of contaminated fruits and vegetables, applications of natural pest control methods such as uses of margosa and citronella in production process could produce chemical free products that are safe for consumption, pesticide chemicals contaminated in soil and in aquatic sources could cause hazardous effects to the animals living in those environments, and farmers should adopt natural pest control methods for the safety of both the farmers and the product consumers. On the other hand, there was a lowest proportion of the agree answer for the question of "natural pest control methods are difficult and time consuming", accounting for 34 % of the total populations at post-intervention, however, increased from 18 % of the agree answer at baseline.

**Table 3.10: Comparison of the mean scores of the participants' attitudes before and after training classified by items.**

| No. | Questions | Baseline | | | | | | Post-intervention | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Agree | | Unsure | | Disagree | | Agree | | Unsure | | Disagree | |
| | | n | % | n | % | n | % | n | % | n | % | n | % |
| 1. | Pest control relies on only pesticide application. | 16 | 32 | 8 | 16 | 26 | 52 | 26 | 52 | 3 | 6 | 21 | 42 |
| 2. | Pesticide sprays, low or high quantity, can be harmful to the users. | 46 | 92 | 1 | 2 | 3 | 6 | 49 | 98 | 1 | 2 | 0 | 0 |
| 3. | A person who never practices pesticide spraying may be harmed by pesticides through consumption of contaminated vegetables and fruits. | 44 | 88 | 3 | 6 | 3 | 6 | 49 | 98 | 0 | 0 | 1 | 2 |
| 4. | Natural pest control methods such as applications of margosa and citronella could produce vegetables that are safe for consumption. | 47 | 94 | 2 | 4 | 1 | 2 | 49 | 98 | 0 | 0 | 1 | 2 |
| 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. | 43 | 86 | 0 | 0 | 7 | 14 | 32 | 64 | 0 | 0 | 18 | 36 |
| 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. | 36 | 72 | 10 | 20 | 4 | 8 | 48 | 96 | 0 | 0 | 2 | 4 |
| 7. | Natural pest control methods are difficult and time consuming. | 9 | 18 | 2 | 4 | 39 | 78 | 17 | 34 | 2 | 4 | 31 | 62 |
| 8. | Consumers should buy chemical free fruits and vegetables. | 42 | 84 | 2 | 4 | 6 | 12 | 45 | 90 | 2 | 4 | 3 | 6 |
| 9. | At present, uses of pesticides for pest control cause problems to human health and to environments. | 46 | 92 | 1 | 2 | 3 | 6 | 44 | 88 | 0 | 0 | 6 | 12 |
| 10. | If there are products of pest control herbs for sale in your community, you will purchase and use them for pest control. | 46 | 92 | 3 | 6 | 1 | 2 | 48 | 96 | 0 | 0 | 2 | 4 |
| 11. | Pesticide chemicals contaminated in soil and in water sources can be harmful to animals living in the soil and the water. | 46 | 92 | 3 | 6 | 2 | 4 | 49 | 98 | 0 | 0 | 1 | 2 |
| 12. | Farmers use natural pest control methods for the safety of both the farmers and the product consumers. | 49 | 98 | 0 | 0 | 1 | 2 | 49 | 98 | 0 | 0 | 1 | 2 |

**Table 3.11: Comparison of the participants' attitudes between questions 1 and 5**

| No. | Questions | Baseline | | | | | | Post-intervention | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Agree | | Unsure | | Disagree | | Agree | | Unsure | | Disagree | |
| | | n | % | n | % | n | % | n | % | n | % | n | % |
| 1. | Pest control relies on only pesticide application. | 16 | 32 | 8 | 16 | 26 | 52 | 26 | 52 | 3 | 6 | 21 | 42 |
| 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. | 43 | 86 | 0 | 0 | 7 | 14 | 32 | 64 | 0 | 0 | 18 | 36 |

**Table 3.12: Comparison of the participants' attitudes between questions 1 and 7**

| No. | Questions | Baseline | | | | | | Post-intervention | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Agree | | Unsure | | Disagree | | Agree | | Unsure | | Disagree | |
| | | n | % | n | % | n | % | n | % | n | % | n | % |
| 1. | Pest control relies on only pesticide application. | 16 | 32 | 8 | 16 | 26 | 52 | 26 | 52 | 3 | 6 | 21 | 42 |
| 7. | Natural pest control methods are difficult and time consuming | 9 | 18 | 2 | 4 | 39 | 78 | 17 | 34 | 2 | 4 | 31 | 62 |

**Table 3.13: Characteristics of those who agree on question 1, 5 and 7 about age, gender, types of vegetable grown and blood test.**

| Person | Gender | Age | Types of vegetable grown | Blood test |
|---|---|---|---|---|
| 1 | Male | 55 | 4 | Normal |
| 2 | Male | 40 | 2 | Safe |
| 3 | Female | 41 | 2 | Normal |
| 4 | Male | 54 | 4 | Safe |
| 5 | Female | 43 | 1 | Safe |
| 6 | Male | 52 | 2 | Normal |
| 7 | Male | 56 | 6 | Safe |
| 8 | Female | 58 | 2 | Safe |
| 9 | Male | 60 | 3 | Safe |
| 10 | Male | 53 | 3 | Safe |

According to Table 3.14, comparison of the mean scores of the participants' pesticide practice before and after training indicated that the improper pesticide practices in Items 2, 4, 6, and 14 identified before training were improved by an increase in percentages of correct practices in Items 2, 6, and 14. However, there was an increase in the percentage of incorrect practices in Item 4 from 22 % at baseline to 90 % at post-intervention.

**Table 3.14: Comparison of the mean scores of the participants' pesticide practices before and after training classified by items.**

| No. | Questions | Baseline | | | | | | Post-intervention | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Regularly | | Occasionally | | Never | | Regularly | | Occasionally | | Never | |
| | | n | % | n | % | n | % | n | % | n | % | n | % |
| 1. | Read instruction labels on pesticide containers every time before use. | 28 | 76 | 9 | 18 | 3 | 6 | 46 | 92 | 2 | 4 | 2 | 4 |
| 2. | Wear protective barriers such as gloves, a nose mask, a hat, safety glasses, long- sleeve shirts, trousers, and covered shoes every time during pesticide spraying. | 24 | 48 | 19 | 38 | 7 | 14 | 47 | 94 | 2 | 4 | 1 | 2 |
| 3. | Prepare chemicals in spraying containers and mix well using a wood stick every time before use. | 43 | 86 | 5 | 10 | 2 | 4 | 45 | 90 | 4 | 8 | 1 | 2 |
| 4. | You smoke or chew food for soothing and relaxing purposes during chemical spraying. | 29 | 58 | 1 | 2 | 20 | 40 | 45 | 90 | 0 | 0 | 5 | 10 |
| 5. | Clean chemical containers after use and keep them out of reach of children and away from animal enclosures. | 45 | 90 | 0 | 0 | 5 | 10 | 49 | 98 | 0 | 0 | 1 | 2 |
| 6. | Prepare several types of chemicals in the same container for fast and convenient process and to reduce numbers of preparation and spraying steps. | 21 | 42 | 2 | 4 | 27 | 54 | 29 | 58 | 3 | 6 | 18 | 36 |
| 7. | Wash used chemical containers and spraying equipment into rivers and streams, as it is easy and convenient. | 25 | 50 | 5 | 10 | 20 | 40 | 45 | 90 | 0 | 0 | 5 | 10 |

**Table 3.14: Comparison of the mean scores of the participants' pesticide practices before and after training classified by items (continued).**

| No. | Questions | Baseline | | | | | | Post-intervention | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Regularly | | Occasionally | | Never | | Regularly | | Occasionally | | Never | |
| | | n | % | n | % | n | % | n | % | n | % | n | % |
| 8. | Spraying chemicals during cool weather is better than spraying during hot weather. | 45 | 90 | 4 | 8 | 1 | 2 | 49 | 98 | 0 | 0 | 1 | 2 |
| 9. | During spraying, should stand at the head of the wind to prevent spread of chemical sprays onto the body. | 48 | 90 | 1 | 2 | 1 | 2 | 49 | 98 | 1 | 2 | 0 | 0 |
| 10. | After spraying chemicals, should clean up your body, hair, and clothes immediately. | 43 | 86 | 6 | 12 | 1 | 2 | 49 | 98 | 1 | 2 | 0 | 0 |
| 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. | 47 | 94 | 2 | 4 | 1 | 2 | 50 | 100 | 0 | 0 | 0 | 0 |
| 12. | Take cautions during chemical spraying to prevent spill of the chemicals and splash onto the body. | 45 | 90 | 3 | 6 | 2 | 4 | 43 | 86 | 4 | 8 | 3 | 6 |
| 13. | When the chemicals are spilled on the floor, soil or wood shavings are used to absorb the spilled chemicals, and then land filled away from residential areas. | 45 | 90 | 4 | 8 | 1 | 2 | 41 | 82 | 6 | 12 | 3 | 6 |
| 14. | After spraying application of each chemical type, place a sign indicating the spraying date and predetermined date for harvesting. | 11 | 22 | 6 | 12 | 33 | 66 | 32 | 64 | 6 | 12 | 12 | 24 |
| 15. | Landfill empties chemical bottles and used containers. | 37 | 74 | 4 | 8 | 9 | 18 | 42 | 84 | 1 | 2 | 7 | 14 |

From Table 3.15, it was found that:

1. The total score for knowledge about pesticides was 11. The participants' average score for the Pre-test was 6.16 scores comparing to 10.74 average scores for the Post-test. Statistical comparison showed significant difference between both mean scores (p-value $< 0.05$).

2. The mean scores of the participants' attitudes towards applications of pesticides and herbal plants for pest control purposes were 19.46 scores for the Pre-test and 20.36 scores for the Post-test indicating better attitudes of the participants towards applications of pesticides and herbal plants after the training program by participatory learning. Statistical comparison indicated significant difference between both mean scores (p-value < 0.05).
3. The mean scores of the participants' pesticide practices were 23.26 scores for the Pre-test and 27.04 scores for the Post-test. The pesticide practice and handling of the participants were more correct after the participatory training. Comparison by statistical test found significant difference between the two mean scores with p-value < 0.05.

**Table 3.15: Comparison of the mean scores of the participants' knowledge, attitudes, and pesticide practices before and after the participatory training.**

| Variables | Pre-test | | Post-test | | t | P-Value |
|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | | |
| Total knowledge score | 6.16 | 2.19 | 10.74 | 2.95 | 8.82 | < 0.05 |
| Total attitude score | 19.46 | 2.63 | 20.36 | 2.30 | 2.09 | |
| Total practice score | 23.26 | 3.21 | 27.04 | 2.73 | 7.12 | |

According to Table 3.16, comparison of the participants' blood results to examine chemical contamination levels using reactive paper found difference in the results before and after the participatory training. That is, there were 28 cases with the

results of unsafe and potential risk levels, accounting for 56 % of the total populations. Comparing of those with the results at 7 months post-training using statistical test found a significant difference between the two results (p-value < 0.05) as there were only 11 cases of the participants with chemical contamination in their blood at unsafe and potential risk levels, which accounted for only 22 % of the total populations.

**Table 3.16: Comparison of the blood test results of the participants before and after the training by participatory learning process.**

| Blood test results | Pre-training | | Post-training | | P-value |
|---|---|---|---|---|---|
| | Number | % | Number | % | |
| Normal | 10 | 20 | 20 | 40 | < 0.05 |
| Safe | 12 | 24 | 19 | 38 | |
| Potential risks | 25 | 50 | 7 | 14 | |
| Unsafe | 3 | 6 | 4 | 8 | |
| Total | 50 | 100 | 50 | 100 | |