MULTI-APPROACH MODEL FOR IMPROVING AGROCHEMICAL SAFETY AMONG FARMERS IN PATHUMTHANI, THAILAND

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รูปแบบการให้ความรู้แบบบูรณาการเพื่อความปลอดภัยในการใช้สารเคมีทางการเกษตรกรรมของชาวนาในจังหวัดปทุมธานี

นางสาวบุบผา รักษานาม

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสาธารณสุขศาสตรดุษฎีบัณฑิต
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Field of Study	Public Health
Thesis Advisor	Professor Surasak Taneepanichskul, M.D.
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Accepted by the College of Public Health Sciences, Chulalongkorn University in Partial Fulfillment of the Requirements for the Doctoral Degree

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บุบผา รักษานาม : รูปแบบการให้ความรู้แบบบูรณาการเพื่อความปลอดภัยในการใช้สารเคมีทางการเกษตรกรรมของชาวนาในจังหวัดปทุมธานี (Multi-Approach Model for Improving Agrochemical Safety among Rice Farmers in Pathumthani, Thailand) อ. ที่ปรึกษาวิทยานิพนธ์หลัก: ศ.นพ.สุรศักดิ์ ฐานีพานิชสกุล, อ. ที่ปรึกษาวิทยานิพนธ์ร่วม: ศ.ดร.มาร์ค เกรเกอรี่ ร็อบสัน, 221 หน้า.

วัตถุประสงค์ 1) เพื่อวัดระดับความรู้ ความเชื่อและพฤติกรรมการป้องกันตนเองของ ชาวนาในพื้นที่ ตำบลคลองเจ็ด อำเภอคลองหลวง จังหวัดปทุมธานี 2) เพื่อพัฒนารูปแบบการให้ความรู้แบบบูรณาการเพื่อความปลอดภัยในการใช้สารเคมีทางการเกษตรกรรมของชาวนาในตำบลคลองเจ็ด อำเภอคลองหลวง จังหวัดปทุมธานี 3) เพื่อประเมินประสิทธิภาพของรูปแบบการให้ความรู้แบบบูรณาการเพื่อความปลอดภัยในการใช้สารเคมีทางการเกษตร ของชาวนาในพื้นที่ ตำบลคลองเจ็ด อำเภอคลองหลวง จังหวัดปทุมธานี โดยศึกษาตั้งแต่เดือนตุลาคม 2552 ถึง เดือนมกราคม 2554

รูปแบบและวิธีการศึกษา การศึกษานี้มีการเก็บข้อมูลทั้งแบบเชิงปริมาณและเชิงคุณภาพ แบ่งเป็น 2 ระยะ คือการศึกษาแบบภาคตัดขวางและกึ่งทดลอง ระยะที่ 1 เป็นการศึกษาแบบภาคตัดขวางเพื่อศึกษาสถานการณ์ทั่วไป ปัญหาและปัจจัยที่มีผลต่อการใช้สารเคมีทางการเกษตรโดยเก็บข้อมูลจากชาวนาในตำบลคลองเจ็ด 482 คน ส่วนระยะที่ 2 เป็นการศึกษาแบบกึ่งทดลองโดยเก็บข้อมูลจากชาวนา 2 กลุ่ม คือ (1) ตำบลคลองเจ็ด (กลุ่มทดลอง) โดยการสุ่มเลือกชาวนา 50 คน จากชาวนา 482 คนในระยะที่หนึ่ง และ (2) ตำบลบึงกาสาม (กลุ่มควบคุม) โดยการสุ่มเลือกชาวนา 51 คน แล้ววัดการเปลี่ยนแปลงคะแนนของ 4 ตัวแปรหลัก คือ ความรู้ ความเชื่อ พฤติกรรม ความปลอดภัยจากการใช้สารเคมีทางการเกษตรที่บ้าน และความร่วมมือของชุมชนเรื่องความปลอดภัยในการใช้สารเคมีทางการเกษตร ภายในระยะเวลา 6 เดือน รูปแบบการให้ความรู้แบบบูรณการนี้ประกอบด้วยการเยี่ยมบ้านและกิจกรรมการมีส่วนร่วมในชุมชนที่เกี่ยวข้องกับความปลอดภัยในการใช้สารเคมีทางการเกษตร

ผลการศึกษา การศึกษาระยะที่ 1 พบว่า ชาวนามีระดับความเชื่อเรื่องความปลอดภัยในการใช้สารเคมีทางการเกษตร โดยรวมอยู่ในระดับปานกลาง โดยที่ความเชื่อด้านโอกาสเสี่ยงต่ออันตราย ประโยชน์ และอุปสรรคในการป้องกันอันตรายจากการใช้สารเคมีการเกษตรอยู่ระดับปานกลาง ในขณะที่ความเชื่อด้านความรุนแรงของสารเคมีทางการเกษตรอยู่ในระดับสูง(มีความเชื่อในเชิงบวก) พฤติกรรมความปลอดภัยในการใช้สารเคมีทางการเกษตรโดยรวมอยู่ในระดับปานกลาง โดยที่พฤติกรรมด้านการใช้อุปกรณ์ป้องกันตนเองอยู่ในระดับต่ำ ในขณะที่พฤติกรรมด้านการดูแลสุขภาพที่เกี่ยวข้องกับการใช้สารเคมีทางการเกษตรอยู่ในระดับปานกลาง นอกจากนี้ยังพบว่าพฤติกรรมที่ไม่ปลอดภัยในการใช้สารเคมีทางการเกษตรส่วนใหญ่มีสาเหตุมาจาก การใช้สารเคมีทางการเกษตรไม่ถูกวิธี ขาดความรู้เรื่องความเป็นพิษและอันตรายจากการใช้สารเคมี การใส่อุปกรณ์ป้องกันตนเองไม่เหมาะสมในขณะปฏิบัติงาน และการดูแลหรือตรวจสอบสภาพอุปกรณ์ที่ไม่ต่อเนื่อง ส่วนผลการศึกษาในระยะที่ 2 หลังจากใช้รูปแบบการให้ความรู้แบบบูรณการนี้เป็นเวลา 6 เดือน พบว่า ชาวนาในกลุ่มทดลองมีระดับคะแนนรวมด้านความรู้ ความเชื่อ พฤติกรรม ความปลอดภัยการจากใช้สารเคมีการเกษตรในบ้าน และความร่วมมือของชุมชนในเรื่องความปลอดภัยในการใช้สารเคมีทางการเกษตรเพิ่มขึ้นอย่างมีนัยสำคัญทางสถิติ ($p<0.05$) ในขณะที่กลุ่มควบคุมไม่มีความแตกต่างอย่างมีนัยสำคัญทางสถิติ ($p>0.05$)

การสรุปและอภิปรายผล โดยสรุปแล้วรูปแบบการให้ความรู้แบบบูรณาการเพื่อความปลอดภัยในการใช้สารเคมีทางการเกษตรนี้ มีผลทำให้ชาวนามีความความปลอดภัยจากการใช้สารเคมีทางการเกษตรมากขึ้นอย่างมีนัยสำคัญทางสถิติ ซึ่งบ่งบอกถึงประสิทธิภาพของการศึกษานี้ได้ดี ความยั่งยืนนี้จะยังคงอยู่ได้ต้องอาศัยความร่วมมือของชุมชนและองค์กรส่วนท้องถิ่นเป็นตัวขับเคลื่อนที่สำคัญ การศึกษานี้สามารถนำไปพัฒนาใช้กับพื้นที่อื่นได้ตามความเหมาะสม ในการวิจัยครั้งต่อไป ควรพิจารณาเรื่องการตรวจหาตัวชี้วัดทางชีวภาพในสารตกค้างของสารเคมีทางการเกษตรร่วมด้วย

สาขาวิชา........สาธารณสุขศาสตร์....................ลายมือชื่อนิสิต.......Bugphr.............

ปีการศึกษา................2554...............................ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก.......................

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KEYWORDS : FARMER / MULITI-APPROARCH MODEL / AGROCHEMICAL SAFETY / COMMUNITY-BASED INTERVENTION / HEALTH BELIEF MODEL

BUPPHA RAKSANAM : MULTI-APPROACH MODEL FOR IMPROVING AGROCHEMICAL SAFETY AMONG FARMERS IN PATHUMTHANI PROVINCE, THAILAND. ADVISOR: PROF. SURASAK TANEEPANICHSKUL,M.D., CO-ADVISOR : PROF. MARK GREGORY ROBSON, Ph.D., 221 pp.

Objectives 1) To evaluate the knowledge, beliefs and behaviors regarding agrochemical safety among rice farmers 2) To develop a model for improving farmer's health and preventing them from agrochemical hazards. 3) To evaluate the effectiveness of the model of interventions associated with improving agrochemical safety among farmers in the Khlong Seven community in Pathumthani province, Thailand over the period October 2009 to January 2011.

Methods Quantitative and qualitative data collections were divided into two phases. Firstly, a cross-sectional study: 482 rice farmers were randomly recruited. Secondly, a quasi-experimental study: fifty rice farmers from Khlong Seven Community (study group) and fifty one rice farmers from Bueng Ka Sam community (control group) were randomly recruited. The mean change in scores of the four variables of knowledge, belief, behavior, home pesticide safety assessment, and community participation regarding agrochemical safety were measured. Intervention involved in a combination of home visits and community participatory activities regarding agrochemical safety.

Results Phase I: Farmers had a neutral level of total belief regarding agrochemical use. They had neutral levels of perceived susceptibility, benefits, and barriers on agrochemical safety. The belief concerning the perceived of severity of agrochemicals was high (positive belief).They had a moderate level of total behavior regarding agrochemical safety and a moderate level of healthy personal care behavior. However, the level of use of personal protective equipment was low. Health risk behaviors regarding agrochemical exposure in the study area were mainly caused by the misuse of pesticides including the erroneous beliefs of farmers concerning pesticide toxicity, lack of attention to safety precautions and the use of inappropriate protective gear. Phase 2: After six months of the intervention program, there were significant improvements in the overall scores on knowledge, belief, behavior, the home's pesticide safety assessment, and community participation regarding agrochemical safety in the study group ($p<0.05$). There were no significant improvements in all total scores for the control group ($p>0.05$).

Conclusion Therefore, this intervention model appeared to be effective in improving agrochemical safety among the Khlong Seven Community rice farmer participants. To sustain the intervention, it is necessary to work collaboratively with the community partners and local authorities. However, this model can be applied to other vulnerable groups, and variation across regions should be concerned. For further study, biomarker assessments in agrochemical residues should be concerned.

Field of Study : Public Health Student's Signature ....

Academic Year : 2011 Advisor's Signature ....

Co-advisor's Signature ....

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CHAPTER I

INTRODUCTION

1.1 Background and Rationale

Agrochemical exposure is one of the most significant occupational risks among farmers in Thailand (WHO, 1990; Ecobichon, 2000). Agrochemicals, especially pesticides, are widely used throughout the world to protect or promote industrial agricultural products. Agrochemicals not only destroy pests but can also damage the surrounding ecosystem and other living organisms necessary for maintaining ecological balance (WHO, 1990; Panuwet et al., 2012; Robson et al., 2010; Siriwong, 2009; Jaipieam 2009; Weisenburger, 1993). The large-scale use of agrochemicals has raised environmental and human health concerns. In Thailand the total amount of imported agrochemicals has dramatically increased. By 2004, the amount of active agrochemicals ingredients imported totaled 99,829 tons, which was nearly 5 times that imported in 1994. The quantities of imported agricultural pesticides was 5,444 tons in 1994 or 1,178 million baht and this increased to 21,589 tons or 3,745 million baht in 2007 (Office of Agricultural Economics, 2007). The total morbidity rates of pesticide poisoning in Thailand in 2006, 2007, and 2008 were 15.9, 18.3, and 14.7 per 100,000 persons, respectively (MOPH, 2009). Morbidity rates associated with organophosphate and carbamate use represent the highest rates of poisoning among farmers (8.0, 7.6, and 6.6 per 100,000 persons, respectively). Reported cases of pesticide poisoning during the years 2005 to 2008 dramatically increased with most cases occurring during May through July, with the highest rates during June. The number of farmers harmed from pesticide poisoning in 2008 stood at 1,705 cases (Bureau of Epidemiology. Department of Disease Control, MOPH, 2009).

The health effects associated with pesticides do not appear to be restricted to only a few chemical classes (Weisenburger, 1993; Beseler, 2008; Winchester, 2009). Short-term exposure can cause irritation of the skin, eyes, nose, as well as impair lung and visual functions. It can also affect one's memory and cause liver, kidney, and stomach discomfort and aplastic anemia. Both short-term and long-term exposure can affect the nervous system (Ecobichon, 2000; Weisenburger, 1993; Robson et al., 2001; Keifer and Firestone, 2007; Alavanja et al., 2004; Calvert et al., 2008; Tan and Mustafa, 2004; Philip, 1999; Nurhayati, 2011; Robson et al., 2010). Several studies have found that farmers are at elevated risk for various cancers, which is related to their exposure to pesticides (Robson et al., 2010).

The consequences of agrochemical exposures on the rural population are compounded by the undocumented status of many of the farmers. Although farmers are aware that pesticides are hazardous and they know they have to take certain actions to protect themselves, farmers have been found to rarely use protective clothing (Pingali and Roger, 1995). The successful implementation and program sustainability of pesticide use reduction relies on maintaining crop yield and increasing farmer earnings (Richter and Safit, 1997). Clearly, farm worker education alone is not the only change needed to protect farm workers from pesticide exposure. Greater enforcement of regulations regarding field sanitation and housing are needed as well (Quandt et al., 2001).

This study was conducted in the Khlong Seven community, in the Klong Luang district of Pathumthani province in Thailand. This community is situated on the Chao

Phrayariver basin, and is surrounded by numerous canals. Rice farmers living in the Khlong Seven community are often not aware of agrochemical safety, especially in their work places and homes. They may not understand the potential adverse effects of pesticide use on their families' health. Furthermore, ecological risks and contamination of human food sources from organochlorines were found in this area (Siriwong, 2008). The Bueng Ka Sam rice farmers were recruited as a control group using the purposive sampling method, and were selected for the similarity of their cultivated land and their year-round growing season. The Bueng Ka Sam community is a sub-district of Nong Suea district in Pathumtani province. It is also situated on the Chao Phraya basin near plenty of canals and plantations. Health risk problems associated with agrochemical exposure, especially pesticide, were found in this area.

Community-based participation is promoted as an important component in the design of community health projects and for improving content and process in several ways. Community involvement in environmental health is a participatory approach to health care that is organized from the perspective of the farmer recipients. The participation of community members in the development of the health model increases the likelihood that it will be culturally appropriate and that its format and content will fit the community's cultural system (Mburu and Ties B., 1989; Spradley, 1979; Holmes, 2006).

The Health Belief Model (HBM) is particularly useful for its simplicity and parsimony in the study of farmer's agrochemical safety behaviors (Becker et al., 1978). The HBM sees behavior as a function of a person's subjective value of an outcome and a farmer's expectation that particular health behaviors result in improvement. The HBM is effective in assessing a person's perceived susceptibility, severity, benefits, and barriers, plus cues to action and self-efficacy as they relate to decisions about whether to take action about a health concern. The principle of the Health Belief Model is based on the following six key concepts: (1) Perceived susceptibility is an individual's assessment of their risk from occupational agrochemical hazards. (2) Perceived severity is an individual's assessment of the seriousness of the occupational or agrochemical hazards, and their potential consequences. (3) Perceived barrier of agrochemical safety is an individual's assessment of the influences that facilitate or discourage adoption of the promoted occupational agrochemical safety behaviors. (4) Perceived benefit is an individual's assessment of the positive consequences of adopting occupational agrochemical safety behaviors. (5) The cues to action are events, either physical symptoms of a health condition or environmental incidents from agrochemical use that stimulate farmers to take action/adopt protective measures. (6) Self-efficacy is the farmer's belief in being able to effectively and successfully carry out the protective measures necessary to achieve the desired results (Glanz et al., 2002; Arcury et al., 2002).

This study applied the principles of the Health Belief Model and community-based participatory approach to develop a comprehensive strategy for improving health and safety behaviors associated with agrochemical exposure. The study focused on farmers' perceived susceptibility, severity, benefits, and barriers related to decisions about whether to take action on environmental health concerns regarding agrochemical exposure. Since a comprehensive model for improving agrochemical safety among rice farmers in Thailand remains limited, an innovative community-based intervention program related to agrochemical safety behavior is needed. The study objectives were to develop a model to improve farmers' health and prevent agrochemical hazards, as well as to evaluate the effectiveness of intervention programs regarding agrochemical safety behaviors among rice farmers in the Khlong Seven community.

1.2 Research Objectives

1. To evaluate the knowledge, health beliefs, behaviors, and community participation associated with agrochemical safety among rice farmers in the Khlong Seven community in Pathumthani province, Thailand

2. To develop a model for improving farmers' health and preventing them from agrochemical hazards among farmers in the Khlong Seven community in Pathumthani province, Thailand during the period from October 2009 to January 2011

3. To evaluate the effectiveness of the model of intervention associated with improving agrochemical safety among farmers in the Khlong Seven community in Pathumthani province, Thailand during the period from October 2009 to January 2011.

1.3 Research Question

Does the intervention increase knowledge, create positive beliefs, and create positive behaviors related to protecting themselves against unsafe agrochemical use?

1.4 Research Hypothesis

Null Hypothesis: The changes in levels of knowledge, belief, behavior, and community participation regarding agrochemical safety are not different compared between the control group and the intervention group.

Alternative Hypothesis: The changes in levels of knowledge, belief, behavior, and community participation regarding agrochemical safety are different compared between the control group and the intervention group.

Research Hypothesis: The intervention resulted in greater improvement in the knowledge, belief, behavior, and community participation regarding agrochemical safety among farmers compared between the control group and the intervention group.

1.5 Scope of this Study

This study was conducted in the Khlong Seven community in Khlong luang district, Pathumthani province in Thailand during the period from October 2009 to January 2011. The research procedure was divided into three phases: preparatory phase (5 months), pre-implementation phase (3 months), and implementation and evaluation phase (6 months). Firstly, the preparatory phase included: building connection, community study, cross-sectional survey and situation analysis. The objective of this phase was to conduct analysis related to health safety and prevention from occupational agrochemical hazards among farmers in the Khlong Seven community. Secondly, the pre-implementation phase: the subjects were recruited to participate in this study. Then, the researchers and the stakeholders participated in preparing the participatory program activities composed of the following: recruiting the participants, assessing the needs among the stakeholders, designing the format of the intervention model, identifying the responsible person for each activity, preparing training materials and instruments, and conducting a pilot project. Thirdly, the implementation and evaluation phase (intervention phase) was a combination of three main steps including the first home visit, community-based participatory activities regarding agrochemical safety, and the second home visit.

The effectiveness of the intervention program was monitored by the changes in the mean scores of knowledge, belief, behavior, an assessment of home pesticide safety, and community participation regarding agrochemical safety. The research instruments consisted of the knowledge on agrochemical use questionnaire, the health beliefs of agrochemical use questionnaire, the agrochemical use behavior questionnaire, home pesticide safety assessment, and the focus group discussion guidelines. Knowledge on agrochemical use involved understanding about the basic knowledge of agrochemicals and agrochemical safety behaviors. Health beliefs on agrochemical use included perceived susceptibility, severity, benefits, and barriers to using agrochemicals. Agrochemical use behaviors involved specifically self-care practice in personal health and concerned the following self-care practices: before spraying, during spraying, storage, transportation, waste management, and health risk management. Fifty rice farmers from the Khlong Seven Community (study group) and 51 rice farmers from the Bueng Ka Sam community (control group) were randomly recruited through support from community leaders. Intervention involved a combination of the home visits (pesticide safety assessments at home) and community participatory activities regarding agrochemical safety.

1.6 Conceptual framework

The schematic below provides an explanation of the factors affecting the health of the rice farmers. These factors consisted of socio-demographic factors (such as gender, age, marital status, education) individual factors, and other factors related to the Health Belief Model.

Independent variables **Dependent variables**

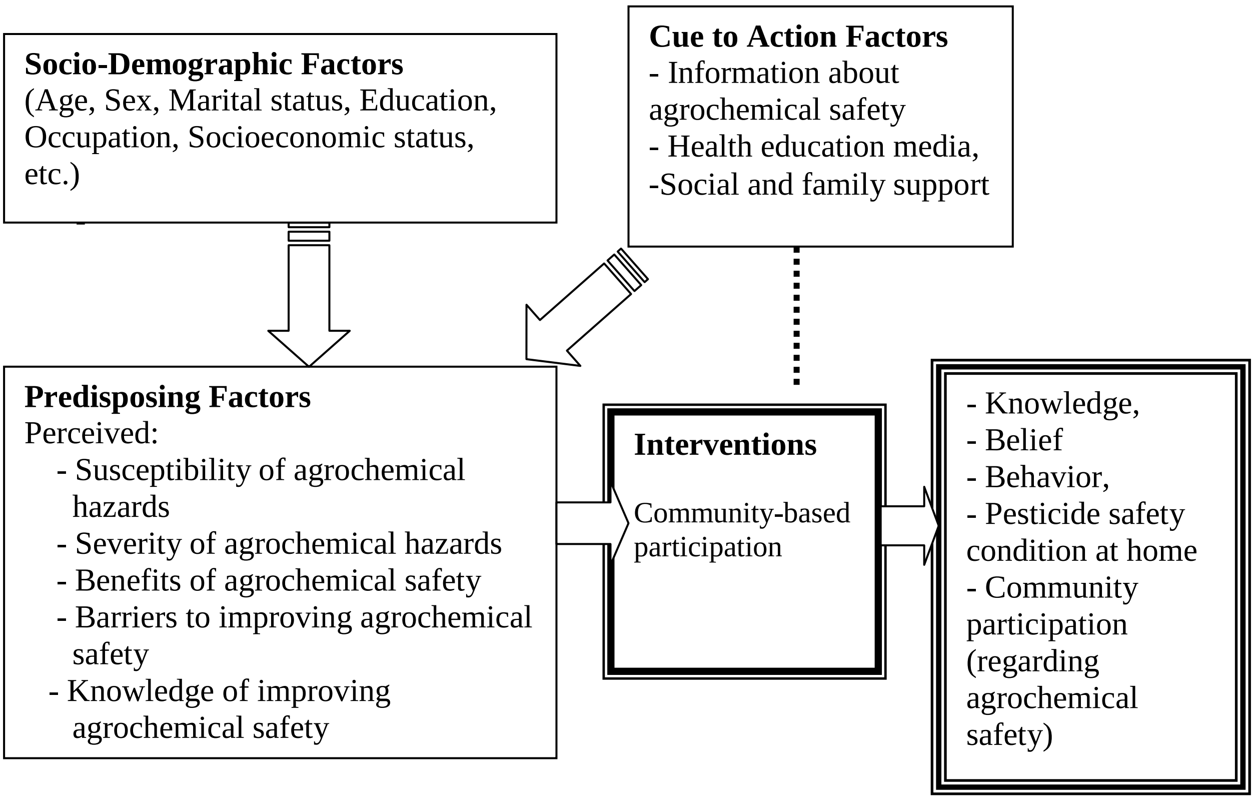

Figure1.1 Conceptual framework of the study

The study's goal was to improve the knowledge, beliefs, behavior and community participation of the rice farmers regarding agrochemical safety. This model aimed to instill health-seeking behaviors through the following interventions

This model postulated to instill health-seeking behaviors which were the interventions including: the first home visit; the second home visit; and community-based participatory action regarding agrochemical safety. This intervention influenced by a person's perception of a threat play in: susceptibility of agrochemical hazards; severity of an agrochemical hazard; benefits of agrochemical safety; barriers to improving agrochemical safety; and knowledge of improving agrochemical safety. These were linked to two main factors, namely cue to action factors and reinforcing factors. Cue to action factors comprised information about agrochemical safety, health education media, social and family support. HBM addressed the relationship between changes in beliefs and behaviors as concerns improvement in agrochemical safety behaviors. It provided the way to understand and predict how the rice farmers behave in relation to their health safety toward agrochemicals and how they complied with health care therapies.

1.7 Operational Definition

1. **Agrochemicals:** A chemical, such as pesticide, a fertilizer, hormone, fungicide, insecticide or soil treatment that improves the production of crops (FAO, 1988). This study focused on pesticides.

2. **Farmer:** A person who operates or manages a farm or a person who obtains the right to collect and retain a tax, rent (Longman, 1999). In this study, a farmer is a person who works as a rice farm and who has lived in the study area for at least one year.

3. Health care worker: Clinical and other staff, including those in primary care, who have regular, clinical contact with patients (Health Protection Agency, 2010). In this study this included: the Khlong Seven Primary Care Unit health care workers; and the Khlong Seven health volunteers.

4. Research assistant: A person who assists the project supervisor in gathering information for a research project (Longman, 1999). This study included certified Khlong Seven trainers.

5. Knowledge: The information and understanding gained through learning or experience (Longman, 1999). This study focused on farmers' knowledge concerning agrochemical safety and hazards in Pathumthani province.

6. Belief: The opinions and feelings that someone usually has about a particular thing, idea, or person (Longman, 1999). This study refers to farmer s'beliefsconcerning agrochemical safety and hazards in Pathumthani province.

7. Behavior: Regular activity that someone does in order to improve a skill or ability (Longman, 1999).Human behavior results from beliefs, social norms, personality, and the expected outcome of a particular person (Suvan, 1983). Practice or behavior evaluations require great observation, both in the process and the action outcome. The equipment used in observation is a checklist, which is one of the standards for recording observational information (Suvan, 1983).

8. Perceived susceptibility: An individual's assessment of their risk of getting a risk condition arising from occupational agrochemical hazards (Glanz et al., 2002).

9. Perceived severity: An individual's assessment of the seriousness of occupational agrochemical hazards, and their potential consequences (Glanz et al., 2002).

10. Perceived barriers: An individual's assessment of the influences that facilitate or discourage adoption of the promoted occupational agrochemical safety behaviors (Glanz et al., 2002).

11. Perceived benefits: An individual's assessment of the positive consequences of adopting occupational agrochemical safety behaviors (Glanz et al., 2002)

CHAPTER II

LITERATURE REVIEW

In this study, the supported theories and specific concepts including: Health Belief Model (HBM); community-based participation (CBP), and agrochemicals are presented as below.

2.1 Health Belief Model

The Health Belief Model is a psychological concept developed by Rosenstock (1966) for studying and promoting the uptake of services offered by social psychologists. The model was furthered developed by Becker and his colleagues in the 1970s and 1980s. Subsequent amendments to the model were made as late as 1988, to accommodate evolving evidence generated within the health community about the role that knowledge and perceptions play in personal responsibility (Glanz et al., 2002). Originally, the model was designed to predict behavioral response to the treatment received by acutely or chronically ill patients, but in more recent years the model has been used to predict more general health behaviors (Rosenstock, 1966).

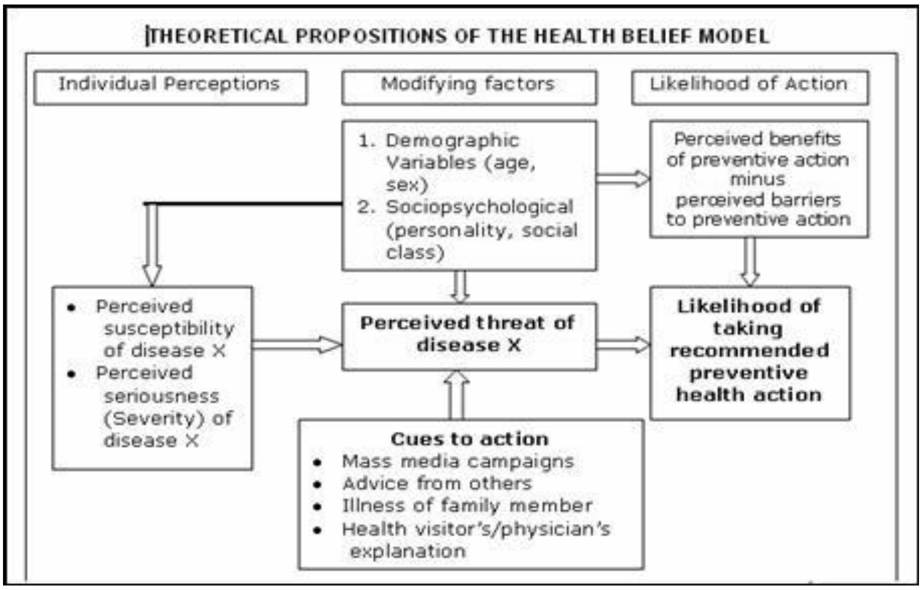

Figure 2.1 Diagram of Health Belief Model (Modified from Glanz et al., 2002)

The original Health Belief Model, constructed by Rosenstock (1966), was based on four constructs of the core beliefs of individuals based on their perceptions including: perceived susceptibility, severity, barriers, and benefits.

Constructs of mediating factors were later added to connect the various types of perceptions with the predicted health behavior: demographic variables (age, gender, ethnicity, occupation); socio-psychological variables (social economic status, personality, coping strategies); perceived efficacy (an individual's self-assessment of ability to successfully adopt the desired behavior); cues to action (external influences promoting the desired behavior, may include information provided or sought, reminders by powerful others, persuasive communications, and personal experiences); health motivation (whether an individual is driven to stick to a given health goal); perceived control (a measure of level of self-efficacy); and perceived threat (whether the danger imposed by not undertaking a certain health action recommended is great).

The prediction of the model is the likelihood of the individual concerned to undertake recommended health action, such as preventive and curative health actions (O'Fallon and Dearry, 2002).

2.2 Community-based participation (CBP)

CBP in public health is a partnership approach to research that equitably involves, for example, community members, organizational representatives, and researchers in all aspects of the research process in which all partners contribute expertise and share decision-making and responsibilities (Israel et al., 2003). The aim of CBP is to increase knowledge and understanding of a given phenomenon and integrate the knowledge gained with interventions and policy change to improve the health and quality of life of community members. CBP has been recognized as a community-driven and action-oriented approach to health research that is highly consistent with the mission and core values of public health (Vasquez, and Shepard, 2006).

Six Principles of CBP

1. Promotes active collaboration and participation at every stage of the research

CBP fosters equal participation from all partners. It provides all participants with an equal sense of ownership over the research and the outcomes. The academic researchers in this project work with two populations: migrant farm workers and tobacco growers. Recognizing that a partnership with a community-based organization does not always lead to the greatest amount of community participation and that there exist different levels of participation, they use five modes of interaction to assure that the voice of the community partners is heard:

1) Partnership with a community-based organization

2) A project advisory committee

3) Community forums for residents more active in the research process

4) Public presentations for less active residents

5) Formative data collection

This last method comprises interviews to help researchers learn about community member perceptions of environmental health concerns and gain insight into social networks. Issues that had to be addressed to assure community participation included transportation and meeting times. On occasion, researchers would provide transportation to residents and convene community forums at times convenient to the population. On the basis of community interaction, researchers developed a two-phase intervention to reduce farmer exposure to harmful agricultural chemicals (O'Fallon and Dearry, 2002).

2. Fosters co-learning

CBP provides an environment in which both community residents and researchers contribute their respective expertise and where partners learn from one another. Community members acquire new skills in conducting research, and researchers learn about community networks and concerns; information that can be used to inform hypothesis generation and data collection (O'Fallon and Dearry, 2002).

3. Ensures projects are community-driven

Research questions in CBP projects are guided by the environmental health issues or concerns of community members. National Institute of Environmental Health Sciences (NIEHS) recognizes that for research and prevention/-intervention strategies to be successful, they have to address the concerns of the community residents. Therefore, all CBP projects supported by the NIEHS build up on needs identified by the community. An additional impetus for Translational Research program initiatives at the NIEHS is the need for community residents to acquire scientific knowledge about environmental exposures in their area that may be used to inform policy and regulatory decisions (O'Fallon and Dearry, 2002).

4. Disseminates results in useful terms

Upon completion of CBP projects, results are communicated to all partners in culturally appropriate, respectful, and understandable terms. Community meetings and sharing of collected data (such as results of biomarkers and neurobehavioral test) with families are two effective ways in which investigators are communicating research results to participating community members. These efforts provide residents with information on research status, implications for their health, and a forum for asking additional questions. Researchers also developed an educational video based on the results of focus group discussions with farm workers' beliefs and practices. This video is used to educate families on how they can minimize contact with pesticides both in and out of the home (Kegler et al., 2000).

5. Ensures research and intervention strategies are culturally appropriate

The active participation of community residents from the beginning, research and intervention strategies are more likely to be based in the cultural context of the community in which such work is intended to benefit. Community residents involved in the research process from the beginning throughout a community advisory board, academic scientists were assured that their efforts would be responsive to the needs and concerns of the residents (O'Fallon and Dearry, 2002).

6. Defines community as a unit of identity

One of the most important challenges to CBP is definition the key term of the word “community” because of its many social dimensions. For example, community could be defined as community residents within a town, an ethnic population, or a set of workers. Because of its dynamic and diverse nature, no one definition of community can be able to applied to every community situation. Therefore, it is very significant that community ultimately be defined by somebody whose health is most likely to be affected by the research (O’Fallon and Dearry, 2002).

Community-based participation benefits

The challenges of implementing and supporting Community-based participation are well documented (O’Fallon, 2000; Silka 1999). The leader among these challenges is ensuring participation on the part of universities, health departments, funding agencies, and federal institutions because CBP may not necessarily fit within their research or funding paradigm, and the benefits of investing time and money into CBP may not be immediately clear to these institutions. Outcomes from CBP projects demonstrate a number of benefits of this methodology for both academic researchers and community members. These benefits depend upon the strength of communication and cultural understanding among all partners. Although communication is not the only aspect crucial to successful community-based participation, without it the benefits of CBP will not be realized. Communication remains a constant element throughout the entire spectrum of community-university interaction (O’Fallon and Dearry, 2002).

The benefits of CBP for both researchers and community members presented as follow (Silka, 1999) presented as follow:

1. Trust between researchers and community

By involving community residents in every stage of the research process and communicating findings to them in culturally appropriate and in easy to understand terms, CBP trust between the research team and target community. Communities often did not receive information from investigators regarding research outcomes and seldom perceived any benefit from having participated in research projects. As a result, community peoples have been hesitant to participate in such work with scientists. Active participation by all organizations in CBP counters increases the likelihood for success of a given study project (O'Fallon and Dearry, 2002).

2. Increased relevance of research question

Community participation makes sure that the research question under investigation is relevant to the community needs and concerns of both the researchers and affected community residents. Without a mutually beneficial research question, the potential impact of the project on public health will be lessened (O'Fallon and Dearry, 2002).

3. Increased quantity and quality of data collection

When trust is established among community partners in a project and the question is of concern to individuals within the community, more community residents participate. This positive relationship enhances recruitment and retention, which, in turn, improves data quality in the community (O'Fallon and Dearry, 2002).

4. Increased use and relevance of data

When research questions are based on issues of significance to both researchers and the community, the data collected are more likely to apply to the scientific hypothesis under study. Moreover, data are useful to the community in addressing the community primary concerns (O'Fallon and Dearry, 2002).

5. Increased dissemination

Community in the context of community-based participation is a social network. If the community possesses a sense of active participation in a research project, they are more willing to assist in dissemination of the findings. This effort can make research results to reach a wider audience of both scientists and health care workers (O'Fallon and Dearry, 2002).

6. Translates research into policy

If research questions are based on community concerns and quality data are collected, there is a significantly greater likelihood that research findings can ultimately be used to impact policy to benefit the health of the affected community. In other words, the knowledge gained through research benefits the overall health status of the community. Moreover, such a change in policy and the resulting improvement in population health, even if on a small scale, will often serve to highlight the researchers' accomplishments to academic institutions and funding agencies (O'Fallon and Dearry, 2002).

7. Emergence of new research questions

Through community involvement new ideas are developed and other questions that were not considered at the beginning of the project are highlighted. As trust increases among researchers and community members, richer dialogue occurs that can open up new research aims (O'Fallon and Dearry, 2002).

8. Extend research and intervention beyond specific project

Development of a strong, trusting relationship enables a community-university partnership to expand its work into multiple future research projects. Such collaborations are often successful in obtaining numerous means of support and in leveraging resources and expertise to create synergistic outcomes (O'Fallon and Dearry, 2002).

9. Builds infrastructure and sustainability.

Partnering with community members from the beginning of the research process is an investment in the community. Residents acquire new skills and become leaders within the community, which leads to sustainability of a project. In turn, this infrastructure development leads to more cost effective research and permits scientists to carry out research projects of longer duration and larger scale (O'Fallon and Dearry, 2002)

A primary goal of community participation is to increase a community's ability to solve the problems throughout the development of effective and sustainable interventions (Metzler et al., 2003). To build this ability, investigator have to work with grassroots organizations, community residents, health care workers, and community leaders to first evaluate the health concerns most pertinent to the community residents and then to continue the discussion as the project develops through design into implementation and finally into health improvement strategies and policies. This is accomplished by the dissemination of knowledge gained through all phases of the study, which includes venues such as community forums, community newsletters, and other community events (Freudenberg, 2001). By engaging community residents in the process, the research is meaningful to those living in the communities and also directly benefits them through the sharing of knowledge and resources. This engagement is ongoing with the project and the development of culturally sensitive interventions (O'Fallon and Dearry, 2002).

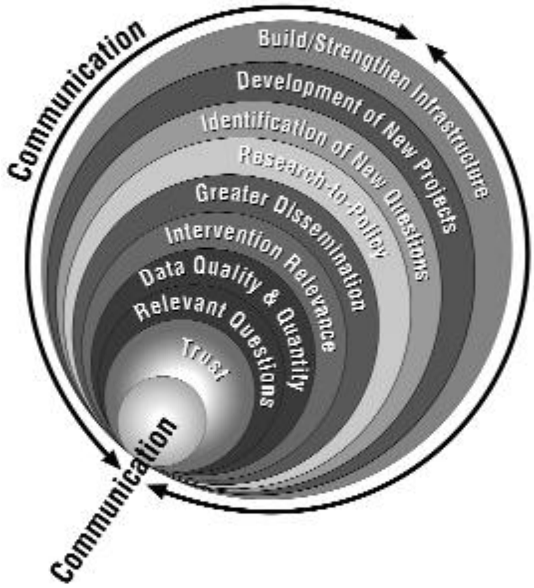

Figure 2.2 Communication Process in CBP (O'Fallon and Dearry, 2002)

Figure 2 shows the importance of communication for achieving benefits from CBP projects. These benefits begin with and are maintained by honest communication among all involved community sectors and investigators in the research project. Each benefit is enhanced by the preceding benefit. So, greater trust translates into increased relevance of questions, which assures better quality data (O'Fallon and Dearry, 2002).

Community-based participatory research: rationale and practical applications

Several investigators have identified the benefits of community-based collaborations for the success of public health research. Community-based approaches improve access to community members and help the researchers establish the trust needed for participation. Community participation increases the likelihood the project will be culturally and educationally appropriate; its format and content will better fit the cultural systems of the community. Community participation increases the sustainability of any intervention based on the research. Finally, community participation helps make a health intervention replicable in similar communities. Although the benefits of community-based participation research are great, the problems often confront encountered in community–investigator collaborations can appear unconquerable. Those who have operated on community-based participation research projects know that tensions in these collaborations can result in community conflict. These tensions between communities and researchers have led some communities working with health worker or researchers to develop research protocols which launch the rules for community–researcher. Community residents may lack motivation, time, or resources to take part , or they may simply not value participation. Finally, there are often different values, sentiments, and needs within even relatively tiny communities, so that there are contending definitions of what it means to act for a community. The tension in community-based research resulted from working with unapproachable or elusive populations such as farm workers. Farm worker communities are occupational groups often not locality based. There may be communication difficulties and transportation difficulties. Farm workers often lack community-based organizations. Efforts to depict features of successful community based research collaborations are significant for continuing and expanding the community-based participation approach to get rid of health disparities (O'Fallon and Dearry, 2002).

How to Measure Community Participation

In the context of CBP, community is a group of people living in the same defined area sharing the same basic values and organization and same basic interests. Participation implies the right and responsibility of people to make choices and therefore, explicitly or implicitly, to have power over decisions which affect their lives (Rifkin et al., 1988).

Rifkin et al. (1988) defined community participation as a social process whereby specific groups with shared needs living in a defined geographic area actively search after identification of their needs, take decisions and set up mechanisms to meet these needs (Eyre and Gauld, 2003).

The rationale for pursuing community participation and promoting positive health, behavioral change, improving service delivery, mobilizing human, financial and other material (including in-kind) resources for health services, and as a means of empowering the community. Community participation initiated by outside actors is only likely to be effective and lasting if the local community achieves a sense of ownership (Jacobs and Price, 2003). If community participation is not an integral part, health programs are unlikely to succeed (Park, 2005). Primary health care is based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain at every stage of their development in the spirit of self reliance and self-determination (USSR, 1978).

Community participation measurement

There is no agreement among planners and professionals about the contribution of community participation to improving the lives of people, particularly the poor and disadvantaged. Some completely dismiss its value altogether, while others believe that it is the ‘magic bullet’, that will ensure improvements especially in the context of poverty alleviation. Despite this lack of agreement, community participation has continued to be promoted as a key to development. Although advocacy for participation waxes and wanes, today, it is once again seen by many Governments, the United Nations agencies and non-governmental organizations, as critical to programme planning and poverty alleviation (World Bank, 1996). Community participation has been a constant theme in development dialogues for the past 50 years. In the 1960s and 1970s, it became central to development projects as a means to seek sustainability and equity, particularly for the poor. It became a central plank for health policy promoted by the World Health Organization in its conference in Alma Ata in 1978 (WHO/UNICEF, 1978). In accepting Primary Health Care as government policy, all members of WHO recognized the importance of involving intended beneficiaries of services and programmes, in their design and implementation. The following reasons for this acceptance were put forward.

1. The health services argument: the services provided are utilized and misused, because the people for whom they are designed are not involved in their development.

2. The economic argument: there exists in all communities, financial, material and human resources that could and should be mobilized to improve local health and environmental conditions.

3. The health promotion argument: the greatest improvement in people's health is a result of what they do to and for themselves. It is not the result of medical interventions.

4. The social justice argument: all people, especially the poor and disadvantaged, have both the right and duty to be involved in decisions that affect their daily lives (Rifkin, 1990).

The World Bank's reasons for community participation are:

1. Local people have a great amount of experience and insight into what works, what does not work and why.

2. Involving local people in planning projects can increase their commitment to the project.

3. Involving local people can help them to develop technical and managerial skills and thereby increase their opportunities for employment.

4. Involving local people helps to increase the resources available for the programme.

5. Involving local people is a way to bring about 'social learning' for both planners and beneficiaries. 'Social learning' means the development of partnerships between professionals and local people, in which, each group learns from the other (World Bank, 1966).

By placing a mark corresponding with the width of participation in the programme on each continuum, over time, it is possible to record the changes in participation.

Assessing participation

If there is no agreement about how to define participation, there is a growing understanding among professionals and planners at least, that participation is best seen as a process, rather than an outcome of an intervention. This does, however, pose questions about how to assess the process in order to assess programme achievements.

What's participation?

Traditionally, community participation has been assessed in quantitative, numeric forms for example, by asking how many people have come to a meeting or how many people have joined in a community activity. The dilemma however, is that presence does not indicate participation.

A more recent visualization that stresses the same points, is that of the spider-gram. Here, it is possible to describe changes in the process by plotting the situation along 5 continuums. Each is a critical factor in participation and all are joined in the middle to give a holistic view of the program. The five factors are: needs assessment, leadership, organization, management and resource mobilization. Although many people agree that community participation is critical in development programs, very few agree on its definition. The various definitions are: Involvement in shaping, implementing and evaluating programs and sharing the benefits; An active process where intended beneficiaries influence programs outcomes and gain personal growth (Oakley, 1989). In the field of health and disability, perhaps a more concrete dissection shows the differences in definition and understanding of the concept.

In this study community participation focused on the Rifkin's theory (1988). Community participation is measured by using a framework developed by Rifkin et al. (1988). They identified five factors which influence the community participation. These factors are (1) needs assessment, (2) leadership, (3) organization, (3) resource mobilization and (5) management. Community participation is measured to examine process rather than impact of community participation in health programs. For each factor, a continuum is developed with wide participation at one end and narrow participation at the other. Then the continuum is divided into a series of points and a mark is placed at the point which most closely describes participation in the health program. These indicators do not value wider community participation as good or bad nor do they relate to improved health status. They are intended to show the changes and the processes of participation in specific health programs. The broad participation builds on a wide range of activities and involvement of many different community groups (Rifkin et al., 1988).

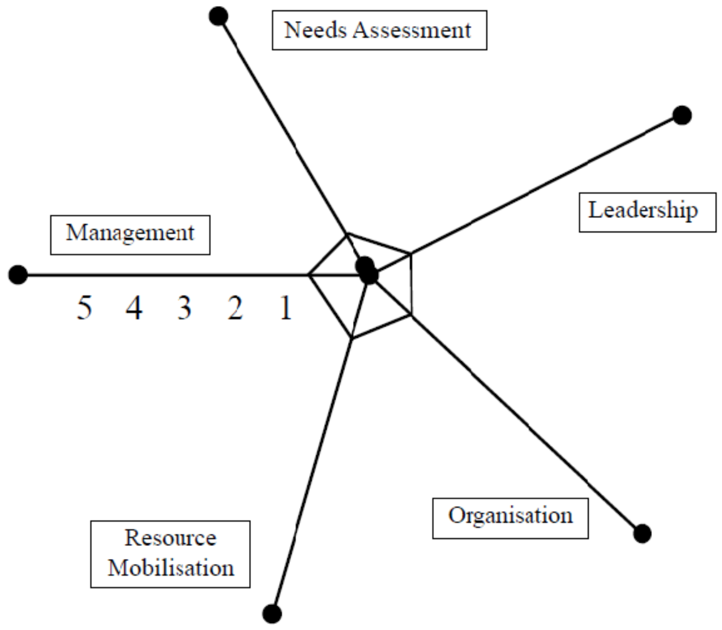

Figure. 2.3 Participation viewed as a Spider-gram (Rifkin et al., 1988)

2.3 Agrochemicals

Agrochemicals are used world-wide to improve or protect crops and livestock. Fertilizers are applied to obtain good yields from crops that are protected from insects and disease by the timely use of pesticides. Farm animals are similarly protected from parasites and disease by veterinary treatment such as vaccination, oral dosing or immersion dipping. The word “use” should be interpreted in its widest sense to include the use by any person, whether employer, worker or family, and should also include any associated activity such as handling, storage, transport, spillage and disposal (International Labour Organization, 1991).

All these uses may involve a wide range of equipment from aircraft to self-propelled sprayers; or from manually operated sprayers to application by hand. The substances in use also vary and may include powders, granules, liquids or gases. Many are poisonous or harmful to humans, livestock, wildlife and the environment through several causes: toxic and corrosive effects; risk of explosion or fire; indiscriminate use that might pollute the air, water and soil resulting in high residual levels in foodstuffs that are consumed; and contamination of drinking-water.

Practical measures to minimize the harmful effects of agrochemicals are described in this guide, together with an outline of good practice in distribution, formulation, use, storage and disposal, as well as the proper recording of relevant events and incidents. The guide also attempts to recognize the special problems within some developing countries. The advice provided should play an important role in ensuring that agrochemicals are used safely and without needless risk to human beings and the environment (International Labour Organization, 1991).

"Agrochemicals" mean all chemical products which are manufactured or processed for use at work in agriculture and related industries. It includes pesticides, veterinary products and the more hazardous fertilizers and chemicals as described in the next section. Agrochemical is a contraction of agricultural chemical. In most cases, agrichemical refers to the broad range of pesticides, including insecticides, herbicides, and fungicides. It may also include synthetic fertilizers, hormones and other chemical growth agents, and concentrated stores of raw animal manure (Jeyaratnam et al., 1987). Some agrichemicals are toxic, and agrichemicals in bulk storage may pose important environmental and/or health risks, particularly in the event of accidental spills. In many countries, use of agrichemicals is highly regulated. On farms, proper storage facilities and labeling, emergency clean-up tools and procedures, and safety tools and procedures for handling, application and disposal are often subject to mandatory standards and regulations. During the application process and subsequent to it, non-target organisms can come into contact with these agrochemicals either throughout direct spraying, or ingestion of the chemicals throughout food and or water (International Labour Organization, 1991).

Agrochemicals refer to all chemical products which are manufactured or processed for use at work in agriculture and allied industries. It includes pesticides, veterinary products and the more hazardous fertilizers and chemicals (International Labour Organization, 1991).

1. Pesticides

Pesticides are a group of agrochemicals intended to destroy or control pests of all kinds. Pesticides are named according to their intended use. For example, insecticides are used against insects, herbicides against plants and fungicides against fungi. Some insect predators, and certain micro-organisms such as bacteria, fungi, and viruses, are also used to kill or control pests (International Labour Organization, 1991).

2. Commodity chemicals

Commodity chemicals are those substances which are manufactured for use in either agriculture or other industries. They may also include by-products of an industrial process or even industrial waste such as dilute caustic or acidic solutions. These substances are generally used in farming and have caustic action on exposed parts of the human body (International Labour Organization, 1991).

3. On-farm veterinary products

On-farm veterinary products are those substances used in the rearing of animals. This group of agrochemicals is applied to the skin of animals or administered orally or by injection by farm workers. It excludes those substances manufactured only for use by veterinary surgeons (International Labour Organization, 1991).

4. Fertilizers

Fertilizers are plant nutrients and trace constituents applied generally to the soil to promote the growth of crops. A list of these chemicals, also known as artificial manure (International Labour Organization, 1991).

Safety and health in use agrochemicals

Safety and health in the use of agrochemicals has been one of the primary concerns of international organizations and of many governments, employers and workers and their organizations for over two decades. Some agrochemicals such as pesticides are extremely hazardous to the health of workers and the general public, and also to the environment. However, they can be used safely if proper anticipations are taken. Many industrially developed countries therefore compel strict regulations with regard to the production, sale and use of pesticides, the most perilous group among agrochemicals. These countries have prohibited or severely restricted the use of some very dangerous pesticides. It may happen that other countries may be enforced to import those prohibited or restricted agrochemicals due to specific needs, for example to eradicate a particular pest. For these countries the economic benefits of agricultural development outweigh the risks involved. As a result, although the safety and community health problems may vary in different countries, it is significant to verify clear, common schemes for the use of agrochemicals (International Labour Organization, 1991).

All those who are responsible for the production, import, storage and sale of agrochemicals have a role to play in ensuring safety and health in their use. International organizations, governments, employers and workers and their organizations, and community leaders have a fundamental role: educating agrochemical users on the hazards of the substances they deal with, how these get in to the body, the nature of toxic effects and the proper methods of use, and advising them of the duties and responsibilities of government authorities, other organizations and the public (International Labour Organization, 1991).

How dangerous substances can enter the body

Most agrochemicals will have an adverse effect if they get in to the body. Those that are more toxic are particularly dangerous even in tiny amounts. Many farm workers die and many more are poisoned or injured each year by such substances entering the body; the main routes of absorption are: through the (dermal absorption) through the respiratory tract (inhalation), and through the digestive tract (ingestion). Almost all such casualties can be avoided by protecting or preventing the entry of agrochemicals into the body (International Labour Organization, 1991).

1. Inhalation: Breathing agrochemicals into the lungs is more likely to happen if they are in the form of gases, fine spray droplets, dust, fumes and smoke. Gases mix with the air. Others tend to remain suspended in the air for some time after release, for example by spraying. Often these particles are so small or well dispersed that they cannot be seen. Spraying agrochemicals without adequate precautions is noted to be a common cause of poisoning by inhalation. Users of fumigants and gases are particularly at risk of poisoning by inhalation. Animal handlers are at risk from inhaling the spray created by animals which shake themselves after emerging from veterinary treatment dips (International Labour Organization, 1991).

Figure 2.4 Shows inhalation exposure

2. Skin absorption: This is one of the most common poisoning routes. Pesticides act on pests and destroy them by penetrating the insect's skin or surfaces of plants considered to be weeds. Therefore, these substances can easily penetrate the intact human skin, if allowed to do so. Some formulations are especially hazardous if they are both toxic and contain penetrative solvents such as kerosene, petroleum products or xylene. These may pass through work clothing unnoticed by the worker. Hot working conditions which open the pores on the skin add a further risk they allow more rapid skin absorption, as does skin damaged by cuts, abrasions or skin disease. Further, many veterinary products are chemicals that can easily be absorbed throughout the skin (International Labour Organization, 1991).

Figure 2.5 Shows skin exposure

3. Ingestion: Contamination of the lips and mouth or accidental swallowing of agrochemicals is often caused by poor hygiene or bad practice. Failure to wash properly before eating is a common cause, as is smoking during work. Attempting to clean a blocked sprayer nozzle by putting it between the lips and blowing through it is another bad practice. In some countries pesticides and veterinary products are decanted from large and properly labeled containers into unlabelled bottles and sold. These could subsequently be mistaken for soft drinks and consumed. Even very small quantities of a toxic substance could cause death if ingested in this way. Inhaled toxic substances could subsequently be ingested by swallowing contaminated sputum (International Labour Organization, 1991).

Figure 2.6 Shows oral exposure

4. Other: Many agrochemicals can cause localized ill-effects on contact with skin or eyes even if they are unable to be absorbed. They include some pesticides, strong acids such as Sulphuric acid and strong alkalis such as caustic soda. Veterinary products may also cause problems when their use is subject to the added task of controlling the animal being treated (International Labour Organization, 1991).

Types of poisoning and injury

The terms of “acute” and “chronic” poisoning are used to describe the harmful effect of an agrochemical on the body. “Acute” means that the effect is either immediate or would appear within a day or two after exposure. Although the acute condition can be directly related to the agrochemical, the user may not be aware of this. The symptoms may appear as a general feeling of sickness, skin irritation or sudden and otherwise unexplained serious illness (International Labour Organization, 1991).

"Chronic" effects, on the other hand, take longer to emerge and are sometimes difficult to relate to agrochemicals or the use of one particular substance because different ones may have been used by the individual concerned. Also, when several agrochemicals accumulate in the body the chronic health effect may be caused by the cumulative effect of several chemicals. Medical practitioners and health personnel are generally aware of the chronic symptoms of agrochemical poisoning. It is therefore important to inform the doctor or the health worker of the agrochemicals one has worked with. Presenting the labels is the recommended way to consult the doctor. Injuries usually result from chemical burns when strong acids or alkalis are used without adequate precautions. Further, injuries could result from self-vaccination while treating animals. While necessary precautions should always be taken to prevent or minimize exposure to agrochemicals, agrochemical poisoning is not uncommon. Therefore, a basic knowledge about the acute effects of the different types of poisoning is of value to the user (International Labour Organization, 1991).

Symptoms of poisoning and injury

1. Poisoning: Symptoms of acute poisoning from pesticides and veterinary products will often develop shortly after exposure. They will depend on the concentration of the product, the toxic substances in it and the amount absorbed; they may be immediate if inhaled or may take longer if absorbed through the skin. Early symptoms commonly include one or several of the following: dizziness, headache, poor coordination, nausea, diarrhoea, sweating, shaking and a feeling of weakness. The more toxic substances could also cause convulsions, irrational behavior or unconsciousness (International Labour Organization, 1991).

2. Irritant injury: The severity of irritant injury is proportional to the concentration of the substance and the sensitivity or condition of the tissue affected. Mild symptoms may be a stinging or scratching of the skin or eyes which, if untreated, will develop into skin blistering or peeling. Gases such as ammonia could cause irritation of the nose and throat. The relationship between cause and effect is generally self-evident but there are exceptions. Some pesticides are as known skin irritants. Either an active ingredient or any other substance in the formulation may be the causative factor. Noticeable injury may be seen only after repeated exposure. Repeated exposure to substances in low concentration such as from handling grass or grain has been recently sprayed may go unnoticed until skin blistering or peeling occurs (International Labour Organization, 1991).

In all cases of tissue damage it is important to avoid secondary infection of the affected tissue. Such infections are common in agriculture (International Labour Organization, 1991).

Safe handling and use of agrochemicals

This major section copes with packaging, transport, transfer, storage, dispensing, pesticide application, other agrochemical applications, spillage and disposal of containers and waste. As pesticide application is a major activity in the use of agrochemicals and also the most hazardous, precautions to be taken before, during and after application are treated separately. Storage, management of spills and disposal are also hazardous operations. Precautions to be taken, both for the safety of users as well as the general public and the environment, are described (International Labour Organization, 1991).

Pesticides

Pesticides can enter the body four routes: Skin, Eyes, Mouth, Lungs. Skin contact is the most common cause of pesticide poisoning for applicators and some pesticides enter the body through the skin quite readily. At the time of mixing, pesticides are more concentrated and the likelihood of injury is increased during this time. Some parts of the body absorb pesticides extremely fast (within a few minutes) and need extra protection. Two such areas are the head and body area between the navel and about mid-thigh. If any pesticide is spilled in this area, wash it off immediately and change clothing (EPA, 2012).

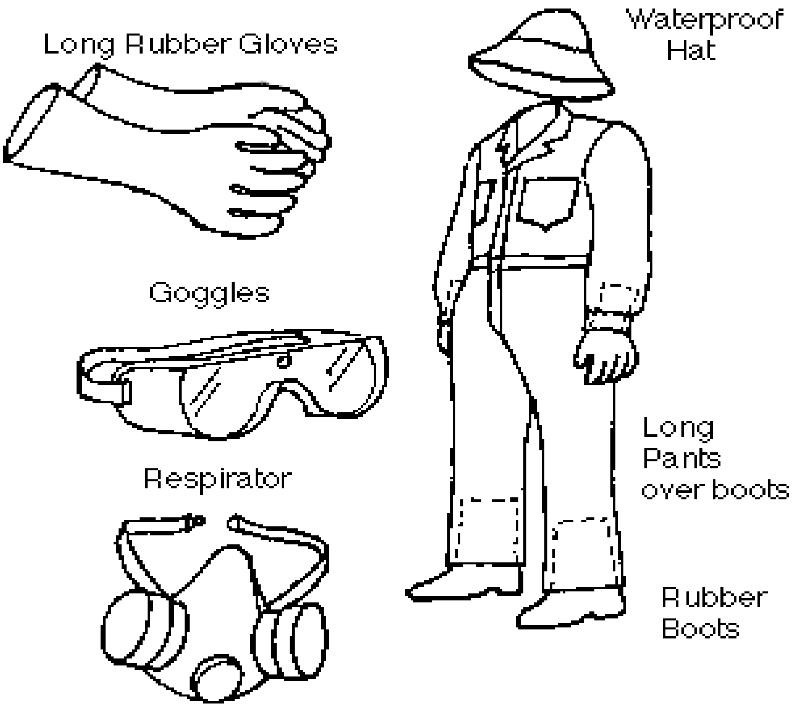

Figure 2.7 Personal Protective Equipment (PPE) Applicators and other handlers must wear**:** Long-sleeved shirt and long pants, Chemical-resistant category A gloves, Shoes plus socks, Protective eyewear such as goggles, face shield or safety glasses (Montana State University, 2005).

Label Signal Words

One of four words are required on a pesticide label to indicate the relative toxicity of the pesticide (EPA, 2012):

1. Danger-Poison or Danger - Toxicity category I - Highly toxic (fatal if ingested)
2. Danger - Toxicity category I - Highly corrosive to eyes and skin
3. Warning - Toxicity category II - Moderately toxic
4. Caution - Toxicity category III and IV - Least toxic

These are known as signal words and are assigned on the basis of the highest measured toxicity, be it oral, dermal, or inhalation; effects on the eyes and external injury to the skin. Since the toxicity category and signal words are based on the total formulation, certain products may have the same active ingredient but may bear different signal words in different formulations. Signal words indicate the relative toxicity of a pesticide formulation. You should always read the pesticide label to determine what Personal Protective Equipment (PPE) that you are required to wear for that product (EPA, 2012).

Gloves

Always wear unlined, elbow-length chemical-resistant gloves when handling all pesticides. The elbow-length protect the wrists and prevent pesticides from running down your sleeves into your gloves. Glove materials include: Natural rubber (latex), only effective for dry formulations. Relatively Permeable; Nitrile, good protection for both dry and liquid pesticides; Moderately permeable; Butyl - good protection for both dry and liquid pesticides; Neoprene -good protection for both dry and liquid pesticides, not recommended for fumigants; Polyethylene; Polyvinylchloride (PVC);

Agrochemical user need to check the quality of construction and material before buying any glove because efficacy varies with the manufacturer. Protection increases with the thickness of the materials, but extra thick gloves may interfere with dexterity. Never use fingerless gloves. Agrochemical user should never use leather or cotton gloves. These types of gloves can be more hazardous than no protection at all because they absorb and hold the pesticide close to your skin for long periods of time. Agrochemical users have to remember that proper glove use is as important as selection. They need to check closely for holes by filling the gloves with air or clean water and gently squeezing. They need to destroy the gloves if any holes appear. They can wrap in a plastic bag and put with an empty pesticide container for proper disposal. In the case of where your hands are reaching up (such as changing nozzles), turn glove cuffs up to form a cup to trap any liquid that runs down the arm. When you are finished spraying, wash your gloves with detergent and water before you remove them. This way, you will not contaminate your hands or the inside of the gloves when you remove them. Then wash your hands with lots of soap and water after you remove the gloves (International Labour Organization, 1991).

Not all glove materials will give you the same level of protection. Some materials will last longer against certain types of pesticides and chemicals. They will be highly, moderately or slightly chemical resistant. The chart below gives you a range of PPE materials from which to choose for each glove category that may be listed on a pesticide label. Use only unlined gloves (Montana State University, 2005).

The chart will also indicate how long you can expect the material to be resistant to the pesticide you are using. For example, the label might say: "If you want more options, follow the instructions for category F on an EPA chemical resistance selection chart." This means you should select PPE made from barrier laminate, butyl rubber, nitrile or Viton because they are highly chemical resistant to that pesticide.

Table 2.1 Chemical resistance of personal protective material (EPA, 2012)

CHEMICAL RESISTANCE OF PERSONAL PROTECTIVE MATERIAL								
Selection Category Listed On Pesticide Label	Barrier Laminate	Butyl Rubber ^{3}14 mils	Nitrile Rubber ^{3}14 mils	Neoprene Rubber* ^{3}14 mils	Natural Rubber ^{3}14 mils	Polyethylene	Polyvinyl Chloride (PVC) ^{3}14 mils	Viton ^{3}14 mils
A (dry and water based foundations)	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
B	HIGH	HIGH	SLIGHT	SLIGHT	NONE	SLIGHT	SLIGHT	SLIGHT
C	HIGH	HIGH	HIGH	HIGH	MOD	MOD	HIGH	HIGH
D	HIGH	HIGH	MOD	MOD	NONE	NONE	NONE	SLIGHT
E	HIGH	SLIGHT	HIGH	HIGH	SLIGHT	NONE	MOD	HIGH
F	HIGH	HIGH	HIGH	MOD	SLIGHT	NONE	SLIGHT	HIGH
G	HIGH	SLIGHT	SLIGHT	SLIGHT	NONE	NONE	NONE	HIGH
H	HIGH	SLIGHT	SLIGHT	SLIGHT	NONE	NONE	NONE	HIGH

Note: Includes natural rubber blends and laminates. "MOD" = Moderate

HIGH: Highly chemical-resistant. Clean or replace PPE at end of each day's work period. Rinse off pesticides at rest breaks

MODERATE: Moderately chemical-resistant. Clean or replace PPE within an hour or two of contact.

SLIGHT: Slightly chemical-resistant. Clean or replace PPE within ten minutes of contact.

NONE: No chemical-resistance. Do not wear this type of material as PPE when contact is possible.

Body Covering

Regular works attire of long pants and a long-sleeved shirt, shoes, and socks are acceptable for slightly toxic (category III- Caution) and relatively non-toxic (category IV - Caution) pesticides. Many applicators prefer work uniforms and cotton coveralls that fit the regular-work-attire description and provide equal protection. Applicators should reserve one set of clothing for pesticide use only. Launder and store separately from all other clothing. To apply moderately toxic (category II - Warning) or highly toxic (category I - Danger or Danger-Poison) chemicals, wear a clean, dry protective suit that covers your entire body from wrists to ankles. The sleeves must be long enough to wear over gloves. Openings, such as pockets, should be kept to a minimum. Protective suits are one- or two-piece garments, such as coveralls, and should be worn over regular work clothes and underwear. Protective suits may be disposable or reusable and are available in woven, nonwoven, coated and laminated fabrics. Since pesticides can work their way through clothing fibers, the degree of protection increases as one moves from woven to nonwoven and from coated and laminated fabrics. Read the manufacturer's label for specific information related to care and intended use (Montana State University, 2005).

Good quality construction, proper fit, and careful maintenance or disposal are also important. Woven fabrics provide a barrier of fabric and air between the wearer and the pesticide but the effectiveness of the barrier depends on the specific properties of the fabric. Tightly woven, cotton twill offers better pesticide protection than other woven fabrics. Cotton coveralls are a sensible choice for general use because they are comfortable, lightweight, readily available, reusable, and affordable. They reduce the risk of dermal exposure to pesticides in dust, granule, or powder form but they do not protect the wearer against spills, sprays, or mists and are not recommended for use with liquid pesticides. Cotton coveralls may be reused if washed properly (EPA, 2012).

Nonwoven fabrics have a random orientation of fibers which do not allow direct paths through the material. Coveralls of nonwoven fabrics are less comfortable than coveralls made of woven fabric and precautions should be taken to avoid heat stress situations. Most nonwoven suits are disposable; they should be discarded after eight hours of use. Uncoated nonwoven fabrics are convenient for use with pesticides in dust, granule, or powder form. They do not protect the wearer against spills, sprays, or mists and are not recommended for use with liquid pesticides and should not be worn when using chlorinated hydrocarbons (Montana State University, 2005).

Fabrics can be made more resistant to pesticide penetration by laminating fabric layers and/or by applying chemical coatings. Chemical -resistant protective suits of coated or laminated fabrics are a must if you (or your helper) will be in a mist or spray that would wet your clothing. Coated and laminated fabrics resist water penetration, but not all of these fabrics qualify as chemical resistant. Chemical-resistant suits are recommended when handling highly toxic (category I) pesticides (Montana State University, 2005).

Apron

Wear a chemical-resistant apron when repairing or cleaning spray equipment and when mixing or loading. This is a good practice for all pesticides and is essential for pesticides of category I and II toxicity. Aprons offer excellent protection against spills and splashes of liquid formulations, but they are also useful when handling dry formulations such as wettable powders. Aprons can be easily worn over other protective clothing and are comfortable enough for use in warm climates. Choose an apron that extends from the neck to at least the knees. Some aprons have attached sleeves. Nitrile, butyl, and neoprene offer the best protection. PVC and natural rubber are also available (Montana State University, 2005).

Boots

The guideline for protecting agrochemical users regarding boots presented as follow: Wear unlined chemical-resistant boots which cover your ankles when handling or applying moderately or highly toxic pesticides. Purchase boots with thick soles. Nitrile and butyl boots appear to give the best protection; Do not use leather boots; If chemical-resistant boots are too hot to wear in warm climates or too difficult to put on, try wearing chemical-resistant over boots with washable shoes (such as canvas sneakers or layered socks.) Remember to put your pant legs outside the boots, otherwise the pesticide can drain into the boot; Wash boots after each use and dry thoroughly inside and out to remove all pesticide residue. Use them only for pesticide applications. It is wise to keep two pair of boots on hand in case of accidental contamination. Wash socks and canvas sneakers worn under chemical-resistant boots just like you would pesticide contaminated clothing. Boots should be replaced at least yearly; As a reminder, write the date of purchase on the boot (Montana State University, 2005).

Goggles or Face Shield

The guideline for protecting agrochemical users regarding boots presented as follow: Wear shielded safety glasses; a full-face respirator; snug-fitting, non-fogging goggles; or a full-face shield whenever the chemical could possibly contact your eyes. Safety glasses with brow and side shields are acceptable for low exposure situations; Always wear goggles or full-face respirator when you are pouring or mixing concentrates or working in a highly toxic spray or dust; In high exposure situations when both face and eye protection are needed, a face shield can be worn over goggles. Clean them after each use; Be careful of the headband; it is often made of a material which readily absorbs and holds chemicals. Have several spares and change them often or use a chemical-resistant strap. If possible, wear the strap under your head covering (Montana State University, 2005).

Head and Neck Coverings

The hair and skin on your neck and head must be protected too. This is most important in situations where exposure from overhead dusts or sprays is possible, such as hand-spraying uphill or when flagging for aerial applications. Chemical-resistant rain hats, wide brimmed hats, and washable hard hats (with no absorbing liner) are good. In cool weather, chemical-resistant parkas with attached hoods are a good choice. If the attached hood is not being used, tuck it inside the neckline so that it will not collect pesticides. Do not use cotton or felt hats; they absorb pesticides. Disposable gloves or shoe covers should be used only once for a very short-term task, and then discarded. First wash the PPE, and then remove them by turning them inside out. Then dispose of them properly (Montana State University, 2005).

Respirators

Respirators protect you from inhaling toxic chemicals. The label will tell you if a respirator is required. Consider wearing one during any lengthy exposure with a high risk of pesticide inhalation. Always wear a respirator while mixing or filling highly toxic pesticides. Applicators who will be constantly exposed to small amounts of moderately toxic pesticides for a day or several days, should also wear a respirator (Montana State University, 2005)**.**

Air-Purifying Respirators

Air-purifying respirators remove contaminants from air by filtering the air. In the majority of situations where a pesticide applicator will need a respirator, an air-purifying respirator will provide adequate protection. These respirators will not protect the applicator from all airborne pesticides, such as fumigants, and are not to be used when the oxygen supply is low. The pesticide label will specify which type of respirator must be worn (Montana State University, 2005).

Air-purifying respirators can be categorized into four styles; cup-shaped filters, full or half-face piece style with cartridges, full or half-face piece style with a canister and the powered air-purifying respirator. The filtering face piece respirator, such as the N95, must be worn when the pesticide label requires one and when the risk of inhaling pesticide dusts, powders, mists, aerosols, or sprays is present. These cup-style dust/mist-filtering respirators are usually made of stiff fabric that is shaped like a cup. It is worn on the face and covers the nose and mouth and filters out dusts, mists, powders, and particles. A respirator that also removes vapors must be worn if the pesticide label requires it and when there is a risk of inhaling gases or vapors. Respirators with full or half-face face piece and have one or more cartridges that contain air-purifying materials can meet this requirement. This face piece style also comes with a large canister that contains more air-purifying materials than a cartridge does. This style must seal tightly against the face. A fit test is necessary before using a cartridge or canister respirator for the first time (Montana State University, 2005).

Pesticide applicators will be given directions on the label for the proper respirator and cartridge. Organic vapor (OV)-removing cartridge respirators will list a choice of either an N, R or P filter or prefilter. Respirator filters/prefilters will be designated as "N" (meaning no oil resistance), "R" (oil-resistant for 8 hours) or "P" (oil-proof, may last longer than 8 hours). This means that "R" and "P" respirators assure that oils will not degrade filter efficiency. Respirator cartridges will have an efficiency designation of 95, 99 or 100. A type 95 is 95% efficient while a type 99 is 99% efficient and the type 100 is the most efficient and equivalent to the old HEPA filter. The type 100 respirators will be designated "HE" (high efficiency) and will be used with powered air-purifying respirators (Montana State University, 2005).

There are three questions that must be answered when selecting a new respirator. They have to do with selecting the type of filter and the efficiency of the filter. The following table sketches out the basics. The third question, "Which filter efficiency do I choose?" requires a little discussion. For all practical purposes, there are two choices, the type 95 and the type 100. Most manufacturers probably will not make both the type 99 and 100, but only the 100 or HE filter or pre-filter. As a general rule, types 95 and 100 are both good for most pesticide uses. When the job requires a HEPA (High-Efficiency Particulate Air) or type 100 respirators, the selection should then be the "HE" or type 100. Higher filter efficiency means lower filter leakage (Montana State University, 2005).

2.4 Relevant research

Juthathip and Genesh (2009) studied pesticide use and prevention practices of tangerine growers in Fang district, Chiang Mai province, Thailand. They found that plantinig experience and pesticides use experience conduced significantly to the use and prevention practices of growers, while the attendance in the training program did not contribute in the same way. Rather, the farmers believed in their experiences and those of their acquintances. Education, training and research into injurious effects and the health and environmental costs of pesticide use are required. The extension workers can go directly to weak points and narrow their intervention plan to alter the pesticide policy instead of providing basic knowledge on pesticides again and again. Knowledge of pesticide prevention practices did not make tangerine growers protect themselves against pesticides or reduce their exposure to chemicals. The training program did not work as the key of extension and should not be presented as one.

Pinyupa et al. (2009) found that pesticide use patterns among small-scale farmers in Thailand need improvement. Educational interventions are essential for promoting safety during all phases of pesticide handling. Public policies should be developed to encourage farmers to change their pest management methods from chemical based to methods that are healthier and more environmentally friendly.

Farahat (2009) studied knowledge and practices of farmer's children on pesticide safety in Menoufia governorate, Egypt. Parents were randomly assigned to either a lecture or videotape training group. Ability to recall information or improve practices among parents was evaluated in 3 sessions: pre-training and 2 weeks and 1 month after training. Knowledge and practice scores after training of younger and more educated participants were significantly higher than older, less educated participants. Knowledge and practice performance of the videotape group was better than the lecture group and in both groups the improvement of knowledge scores after training was significantly higher than that of practice scores

Shedra et al. (2009) applied community-based ethnography and public health risk assessment to assess beliefs about pesticide exposure risks among farm workers in the Lower Yakima Valley of Washington State. They elucidated farm worker's pesticide-relevant beliefs regarding perceived danger and susceptibility to pesticides, the need to put safety second to financial considerations, and reasons for delaying decontamination. Researchers and policymakers should incorporate these data in study designs and legislation concerned with farm worker exposure to pesticides.

Matthews (2009) studied practices and attitudes and behaviors of small-scale farmers towards the use of crop protection products by using a questionnaire in 26 countries. The survey of at least 250 users per country of portable equipment, predominantly knapsack sprayers with various types of pesticide, aimed at revealing the extent of safe use knowledge attitudes and behaviors. This can then be used to target specific gaps by future training programs particularly where problems existed. The vast majority of pesticide users were aware of the need for personal protection and the simple steps for avoiding exposure. The extent of wearing appropriate personal protective clothing did vary with some due to their attitude to the risk of poisoning and the lack of availability or cost of suitable personal protective equipment (PPE). Relatively few incidents arising from the use of pesticides were reported, and those that required hospital treatment were largely following the use of organophosphate insecticides. Overall, most small-scale users of pesticides had a working knowledge of the requirements for safe use and a high proportion of them were able to achieve this as indicated by the low numbers of incidents affecting their health. Key areas for further training include the provision of secure stores and improvements in disposal of used containers.

Alicia et al. (2009) evaluated a community based participatory research worksite intervention intended to improve farm workers' behaviors at work and after work to reduce occupational and take-home pesticide exposures. The workers received warm water and soap for hand washing, gloves, coveralls, and education. Self-reported assessments before and after the intervention revealed that glove use, wearing clean work clothes, and hand washing at the midday break and before going home improved significantly. Some behaviors, such as hand washing before eating and many targeted after-work behaviors, did not improve, indicating a need for additional intervention.

Julie Samples et al. (2009) evaluated indigenous and Latino farm workers' occupational health and safety needs and measured variables related to pesticide exposure and pesticide safety training among this population. Results yielded differences between indigenous workers and Latino workers related to language barriers, experiences of workplace discrimination, preferred modes of information dissemination, pesticide exposures, and sufficiency of pesticide training. Employing more people who speak indigenous languages as interpreters, community and organizational leaders, and health workers may remove some of the linguistic and cultural barriers to occupational safety training.

Thompson et al. (2008) examined the effectiveness of a randomized community intervention to reduce pesticide exposure among farm workers and their children. They found no significant decreases in urinary pesticide metabolite concentrations or in pesticide residue concentrations in house and vehicle dust from intervention community households compared with control community households after adjusting for baseline. These findings may have implications for future community-wide interventions.

Matthews (2008) revealed the vast majority of farmers were aware of the need for personal protection and the simple steps for avoiding exposure. The extent of wearing appropriate personal protective clothing did vary with some due to their attitude to the risk of poisoning and the lack of availability or cost of suitable personal protective equipment (PPE). Relatively few incidents arising from the use of pesticides were reported, and those that required hospital treatment were largely following the use of organophosphate insecticides. Overall, most small-scale users of pesticides had a working knowledge of the requirements for safe use and a high proportion of them were able to achieve this as indicated by the low numbers of incidents affecting their health. Key areas for further training include the provision of secure stores and improvements in disposal of used containers.

Susan et al. (2007) found that the US/Mexico border region farmers who got education programs based on Health Belief Model including pesticide safety, have statistically significant changes occurred with both knowledge and behavior in regards to safe pesticide use. Through this culturally appropriate intervention, the promoters provide practical information allowing clients to make their homes safer.

Pamela (2006) conducted in-depth interviews with 41 Latino women in farm worker households regarding their knowledge of pesticides and perceptions of risk to their children’s health. Their perceptions and behavior differ from scientific understanding and policy recommendations for exposure management, resulting in behaviors that may increase children’s risk of exposure and subsequent health problems. Because the level at which exposure becomes harmful remains a subject of scientific debate, the wisest course of action is to minimize exposure (the precautionary principle). Families living in farm worker households would benefit from health education programs that target their specific needs.

Wutthichai (2006) studied the effectiveness of the participatory learning program on pesticide utilization among agriculturists in Sukhothai, Thailand by applying participatory learning program with Health Belief Model. He revealed that after the intervention was implemented, the experimental group had significantly higher mean scores of knowledge, attitude, and practice than that before receiving the program ($p<0.001$). On the contrary the mean scores of the control group were unchanged ($p>0.05$) between pre-test and post-test evaluations. Therefore the participatory learning program was effective in increasing knowledge, attitude, and practice of participants.

Quandt et al. (2006) conducted a review of the following databases: Medline, Science Citation Index, Social Science Citation Index, PsycINFO, and AGRICOLA. She found that despite ongoing concern about pesticide exposure of farm workers and their families, relatively few studies have tried to test directly the association of behavioral and environmental factors with pesticide exposure in this population. Future studies should attempt to use similar behavioral, environmental, and psychosocial measures to build a body of evidence with which to better understand the risk factors for pesticide exposure among farm workers.

Surasak and Peeungjun (2005) found that there were 3 major occupational health and safety problems among farmers in Pathumthani, Thailand: symptoms from pesticide exposure (65% of respondents), musculoskeletal problems during various process (16.6%–75.9%), and injuries during various process (1.1%–83.2%). This study showed that participation with farmers could create a real sustainable model to promote farmer's health and prevent them from occupational health hazards.

Poss and Pierce (2003) found that it is necessary to reduce possible health and environmental risks associated with pesticide use by documenting risk perceptions and developing ways to address them and need to improve educational interventions are essential for promoting safety during all phases of pesticide handling.

Arcury et al. (2002) adopted a community-based participatory research project designed initially to reduce farm-worker pesticide exposure by developing, implementing, and disseminating a culturally appropriate safety education program. Based on the Health Belief Model (HBM) and using questionnaire data from farm workers in North Carolina.

Arcury et al. (2002) examined the perceived pesticide safety risk and perceived pesticide safety control among farm-workers with a main focus on education. The authors indicated that they used this model as a frame-work to study farm worker's behaviors because it is simple and because of its parsimony. Receiving information about pesticide safety reduced perceived pesticide risk and increased perceived pesticide control. For pesticide safety education to be effective, it must address issues of farm-worker control in implanting workplace pesticide safety.

Thomas et al. (2002) conducted the safety intervention program for North Carolina Farm worker based on Health Belief Model. Finding from this study, farm worker had fairly high levels of perceived risk from pesticides and perceived control of pesticide safety. Receiving information about pesticide safety (e.g., warning signs) reduced perceived risk and increased perceived control. Pesticide exposure knowledge was strongly related to perceived risk. However, perceived risk had a limited relationship to safety knowledge and was not related to safety behavior. Perceived control was not related to pesticide exposure knowledge, but was strongly related to safety knowledge and safety behavior.

Arcury et al. (2001) found that Health beliefs among some Mexican farm workers in North Carolina may have incurred some difficulties in making use of the most basic safety and sanitation facilities that were available to them. Farmers did not understand pesticide risks faced by farm-workers who were not applicators. They also felt that many Latino workers come from a backward society, were not accustomed to the modern facilities the farmer provides; therefore they did not appreciate or use the facilities. Based on the results reported the authors recommended two levels of interventions: one to provide farmers with the information on the farm workers beliefs and two to change the farmers' knowledge and beliefs about farm worker pesticide exposure. Other recommendations were to include appropriate safety information with safety training for farm workers.

Quandt et al. (2001) found that the PRECEDE-PROCEED Framework including Health Belief Model was an effective and efficient means to assess the local work environment and develop an appropriate intervention. Participatory research is effective for designing a health intervention where diverse social, cultural, political, and regulatory issues affect farm worker's risk of exposure in the North Carolina.

Quandt et al. (2001) The US-EPA Worker Protection Standard (WPS) mandated training programs to prevent or reduce occupational health hazard from agricultural chemical exposure among Latino migrant farm workers. WPS implementation in a local context requires understanding individual, workplace, and community environmental factors that lead to exposure and influence intervention effectiveness. Participatory research within the community planning framework (including Health Belief Model) was used to design a WPS training program for Mexican farm workers in North Carolina cucumber and tobacco production. Data collection were gathered and analyzed through individual and group interviews, an advisory board, community forums, and a partnership between academic investigators and a community-based organization. The intervention focused on key health behaviors; relevance to local conditions; and attention to issues of control in the work site. Participatory research is effective for designing a health intervention where diverse, cultural, political, social, and regulatory issues affect farm workers' risk of exposure. This study found clearly, farm worker education alone was not the only change needed to protect farm workers from pesticide exposure.

Several beliefs on pesticides held by farm-workers have been identified and were vital in guiding the workers' behavior; therefore they are of importance to address for any intervention program as they might lead to increased workers' exposure to pesticides. For examples, some workers' believed that pesticides are present only when they can be felt, seen, tasted or smelled; others believed that the skin in general will block any absorption of the pesticide and only body openings would facilitate its absorption; others believed that exposure occurs only when the pesticide is wet; others believed that susceptibility is different from person to person; and others believed that acute exposure is the real danger and not the low level chronic exposure (Elmore and Arcury 2001; Quandt et al., 2001; Quandt et al., 1998).

CHAPTER III

RESEARCH METHODOLOGY

The research procedure was divided into three phases: preparatory phase, pre-implementation phase; and implementation and evaluation phase. This chapter focused on the following topics:

3.1 Research design

3.2 Study area and study period

3.3 Sample and sample size

3.4 Procedure and plan study

3.5 Structure of Intervention model

3.6 Measurement tools

3.7 Data collection

3.8 Data analysis

3.9 Ethical Consideration

3.1 Research Design

The study design was quasi-experimental study incorporated into community-base participatory research design. The effectiveness of the intervention program was monitored by the changes of mean scores of knowledge, belief, behavior and an assessment of the home's pesticide safety. This study was conducted in Khlong Seven community from October 2009 to January 2011.

The sample was divided into 2 similar groups, the intervention and control groups.

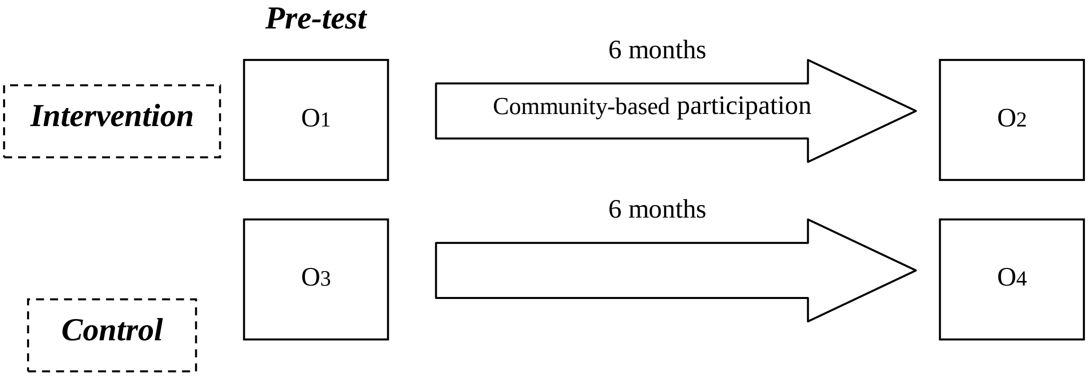

Figure 3.1 Diagram of study design

O1: Farmers in intervention group

O2: Farmers in intervention group after (CBP) intervention

O3: Farmers in control group

O4: Farmers in control group after 6 months

3.2 Study Area and study period

This study was conducted in Khlong Seven community, in the Klong Luang district, of Pathumthani province, in Thailand. This community is situated on the Chao Phraya river basin, and is surrounded by numeros canals. The Pathumthani province is about 46 kilometers from Bangkok. This province occupies an area of 1,525 square kilometers and is administratively divided into seven districts including: Muang Pathum Thani district, Lat Lum Kaeo district, Sam Khok district, Thanyaburi district, Khlong Luang district , Khlong Luang district, and Lam Luk Ka district. The districts are sub-divided into 60 communes and 529 villages. Khlong Luang district is subdivided into 7 sub-districts, sub-divided into 106 villages. Rice farmers living in the Khlong Seven community are often not aware of agrochemical safety, especially in their work places and homes. They may not understand the potential adverse effects of pesticide use on their families' health. Furthermore, ecological risks and contamination of human food sources from organochlorines were found in this area (Siriwong, 2008).

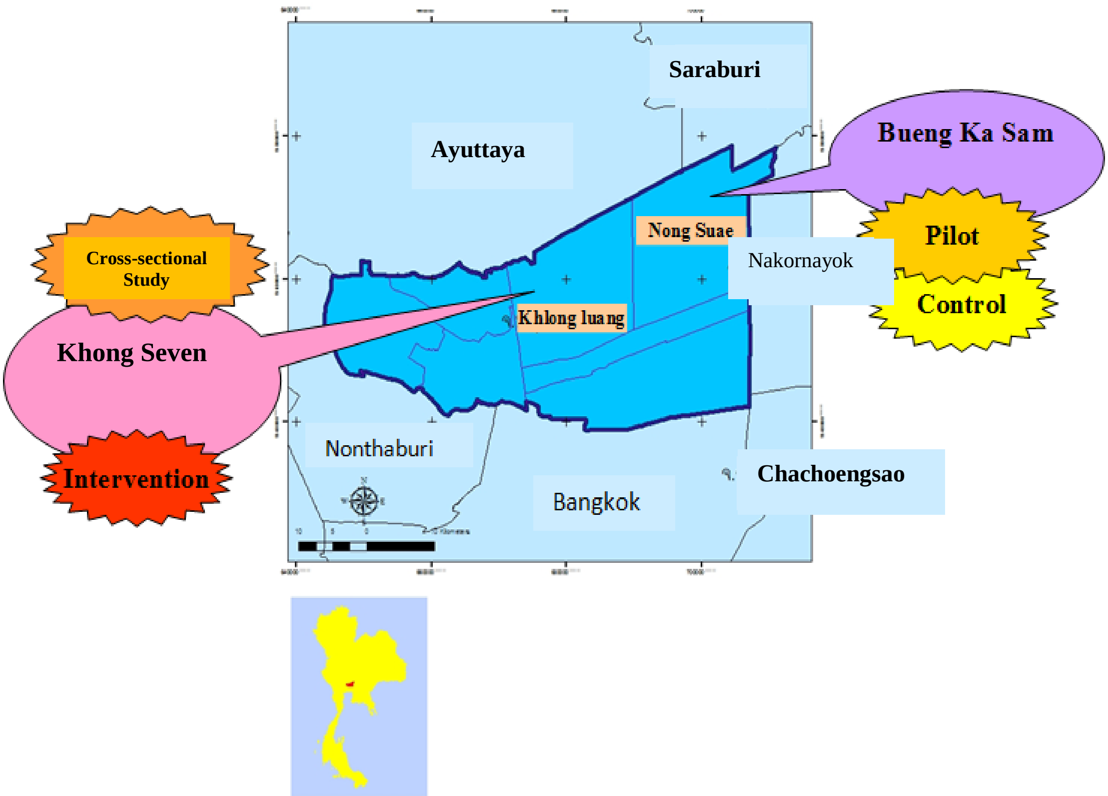

Figure 3.2 Map of the study area

(Energy Research Development Institute Chiang University, 2007)

The Bueng Ka Sam rice farmers were recruited as a control group using the purposive sampling method, and were selected for the similarity of their cultivated land and their year-round growing season. The Bueng Ka Sam community is a subdistrict of Nong Suea district, in Pathumtani province. It is also situated on the Chao Phraya basin near plenty of canals and plantations. Health risk problems associated with agrochemical exposure, especially pesticide, exposure were found in this area. Nong Suea district is administratively divided into 7 sub-districts including: Bueng Ba sub-district, Bueng Bon sub-district, Bueng Ka Sam sub-district, Bueng Cham Oa sub-district, Nong Sam Wang sub-district and Sala Khru sub-district. Bueng Ka Sam community was as area for control group by using the purposive sampling according to the similarity of cultivated land and be the area with all year round growing the crop. Health risk problems associated with agrochemical exposure especially pesticide exposure were found in this area.

3.3 Sample and Sample size

Study population

The study populations were the rice farmers who had been worked at farm and risk to occupational agrochemical hazards in Pathumthani province, Thailand.

Study Subjects

The study participants were the farmers who had been worked at farm and risk to occupational agrochemical hazards in Khlong Seven, Khlong Luang district, Pathumthani.

The inclusion criteria presented as follows;

- Participants who were willing to participate in the study.
- Criteria for test selection included associations with recent agrochemical use in the literature and earlier experience in the same region.
- Farmers who had lived in the Khlong Seven community and use agrochemical for at least one year.
- Farmers who have no communication problems

The exclusion criteria presented as follows;

- Farmer who has acute and chronic renal and liver system diseases.
- Participants who wanted to leave from the study

Sample size calculation

Sample calculation was divided to 2 parts:

1. Sample size calculation in cross-sectional survey study
2. Sample size calculation in quasi-experimental study

1. Sample size calculation for cross-sectional survey study

Formula of sample size calculation using in a cross-sectional survey study based on the proportion of farmers presented as follows (Daniel, 1999; Gulford and Fruchter, 1978; Lemeshow et al., 1990)

$$n = \frac{z^2 p(1-p)}{e^2}$$

Where n = the population size

p = the proportion of risk farmer in Pathumthani = 62.67% (Surasuk, 2005)

z = the confidence level =1.96 at confidence interval 95%

e = margin of error = 0.05

$$n = \frac{(1.96)^2 (0.63)(1-0.63)}{0.05^2}$$

$$n = 358.20$$

Adjusting for potential dropouts, 35% of participants added, therefore sample size for estimation the farmer population in cross-sectional survey was 482 subjects.

2. Sample size calculation in quasi-experimental phase (implementation and evaluation phase)

According to the key concept of community-based participatory approach, small sample size is more effective than that another big size, participants from each village were selected by using the proportional sampling.

In order to detect a true difference between study and control groups, the sample size of study and control groups were performed as follow;

$$n/group = \frac{\boldsymbol{\sigma}^2 (Z_\alpha + Z_\beta)^2}{\boldsymbol{\delta}^2}$$

Where, difference in population means (**δ**) = 5

Type I error probability **(α)** = 0.05

Given a standard deviation (σ) =8.5)

Ratio of control per study group = 1

$$n/group = \frac{8.5^2 (1.960+0.842)^2}{5^2}$$

$$= 22.69 \times 2 = 45.38 \sim 46 \text{ cases/group}$$

Adjusting for potential dropouts, 10 % of participants were added. Therefore sample size for estimation the farmer population was approximately 50 subjects.

The equation for calculation sample size in each village presented as follows;

$$n = (50)(x)$$

Where n is the sample size in each village

x is the proportion of farmer population in each village

The example of sample calculation per village in Village1 in Khlong Seven community presented as follow.

Where (x) = 0.46

n1 = (50)(x)

= (50)(581/1,266)

= 23

n1 = 23

Therefore, the subjects recruited from Village1 in Khlong Seven community were 23 subjects. As well as sample size calculation from other villages both intervention and control groups was done as the same way (Table 3.1 and Table 3.2).

Table 3.1 Proportional sampling of households in the Khlong Seven community (intervention group)

Total House hold	**Village**								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
N=1,266	581	116	91	57	102	45	111	116	47
n=50	23	4.5	3.5	2.5	4	2	4.5	4.5	2
50	23	4	4	3	4	2	4	4	2

Note: The total of the rice farmer families in Khlong Seven community was 1,266 house holds

Table 3.2 Proportional sampling of households in the Bueng Ka Sam community (control group)

Total House hold	Village								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
N=1,456	118	234	291	161	160	67	117	111	197
n=50	4	8	10	5.5	5.5	2.5	4	4	7
51	4	8	10	5	6	3	4	4	7

Note: The total of rice farmer families in Bueng Ka Sam community was 1,456 house holds

The subjects in both intervention and control groups were selected to be the representative of household by using a sampling technique presented as follow figure 3.3 (One farmer per one household).

Sampling technique

Participants were selected by randomization. The data was collected over the period October 2009 to January 2011. This study was carried out in the Khlong Seven sub-district and Bueng Ka Sam sub-districts.

Process 1: Sampling of districts

Khlong Luang district was selected as an intervention area, while Nong Seua district was selected as a control area by using the purposive sampling.

Process 2: Sampling of sub-districts

In this study, Khlong Seven sub-district was selected as a target area, while Bueng Ka Sam sub-district as area for control group by using the purposive sampling according to the similarity of cultivated land and be the area with all year round growing the croup. Moreover, two sub-districts had the potential in term of the human resources (health staff team) and the budget to support this study.

Process 3: Sampling of households

There were 1,266 households and 5,565 persons in Khlong Seven sub-district, while 1,456 households and 6,459 persons in Bueng Ka Sam sub-district (Klong Seven PCU, 2010). The total sample size was selected by using the proportional sampling.

Process 4: Sampling of subjects

The subjects in both intervention and control groups were selected to be the representative of household by using sampling presented as follow (figure 3.4), which one farmer per one household was selected.

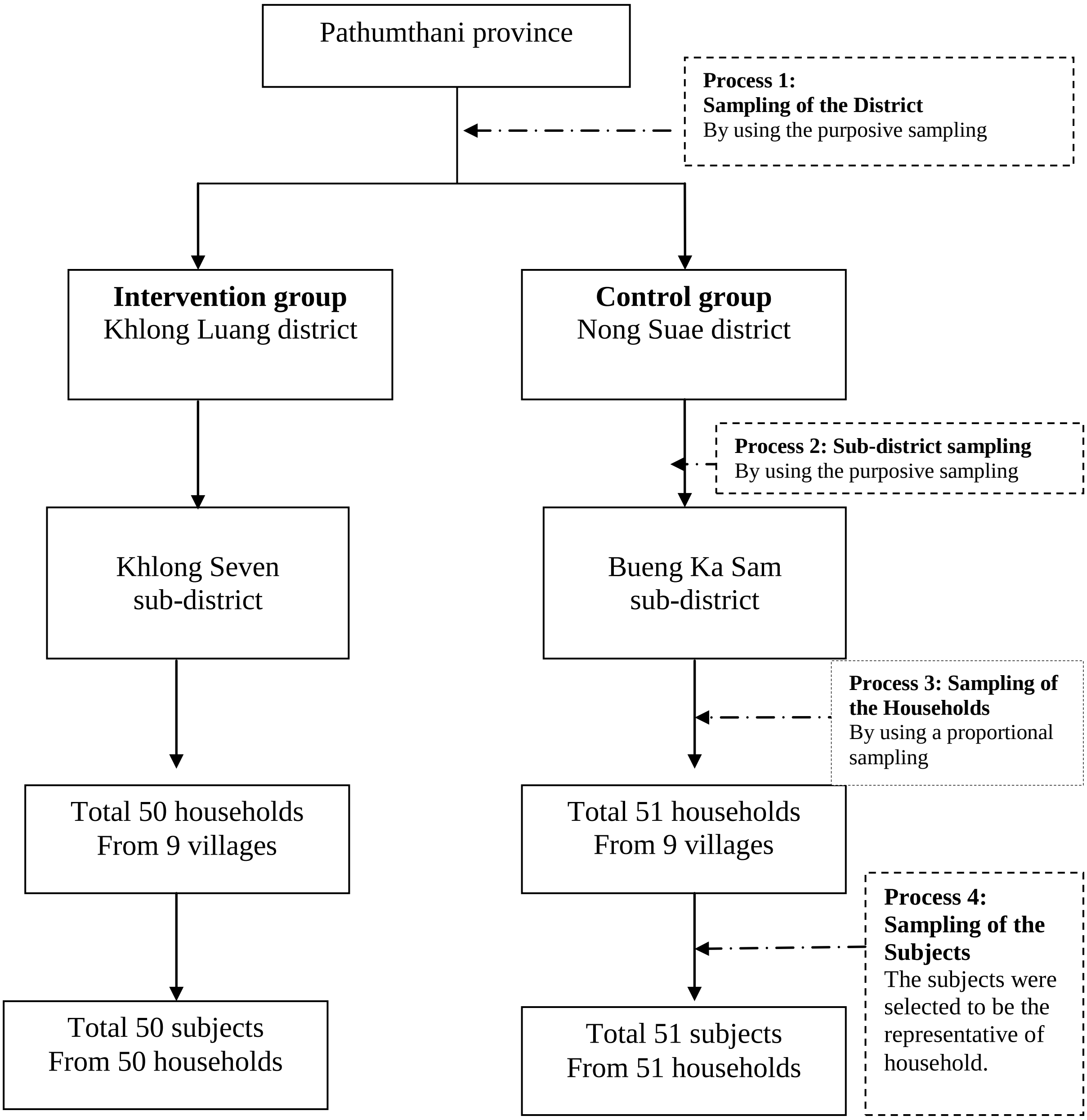

Figure 3.3 Diagram for sampling study

3.4 Procedure and plan study

The concepts of community-based participation (CBP) and home assessments based on Health Belief Model were applied in this study. The research procedure was divided into three phases: preparatory phase (5 months), pre-implementation phase (3 months); and implementation and evaluation phase (6 months).

1. Preparatory phase

1.1 Building connection: By involving Khlong Luang District Health Officer, Khlong Seven healthcare workers, community leader, village health volunteers, farmers and their families in the planning stages of the safety program, participation was be encouraged by stakeholders and communities.

1.2 Community study: This process aimed to understand the baseline data of the understand the baseline data of the community including characteristics of the community, history, population structure, political, economics, community power, social and culture characteristics, health status, the month, year schedule of Khlong Seven Community.

1.3 Cross-sectional survey and situation analysis

The objective of cross-sectional survey was situation analysis related to health safety and prevention from occupational agrochemical hazards among farmers in Khlong Seven community. This initial stage of talking with the community was focused on the issue of agrochemical safety and education. Questions to be addressed included: Is this issue relevant to farmers? How important is this issue when compared to other concerns the farmers may have? Other issues that should be addressed in this early stage include the time, location, and format of the proposed Safety Program.

2. Pre-implementation phase

In this phase, the subjects were recruited to participate in this study. Then, the researchers and the stakeholders participated in preparing the participatory program activities composed of: recruiting the participants, assessing the needs among the stakeholders, designing the format of participatory learning program, identifying the responsible person for each activity, and preparing training materials and instruments.

2.1 Participants recruitment

Recruiting participants was one of the most difficult aspects of a project. Farmers had limited free time and their work schedules might change with little notice. It was important to adjust to the time demands of the participants by presenting programs at their own work and housing sites whenever possible. The village health volunteers meeting at Khlong Seven Health Center was set up. During this meeting, the researchers informed the village health volunteers the details of study program. Then, let them invite the farmers who needed like to participate in this program by signing an informed consent form. Afterwards, the researcher selects the subjects from the total of willing farmers by using random sampling. In control group (Bueng Ka Sam sub-district, Nong Suae district), participants were recruited by using the same method as the intervention group.

2.2 Implementation design

The meeting among stakeholders and Khlong Seven community representatives were held and stakeholders to review materials, discuss tactics for accomplishing the project goals, and generated new ideas. In this study, stakeholders and the Khlong Seven community representatives included: Khlong Luang District Health Officer; Khlong Seven primary health officers; and Khlong Seven community leaders were performed. These stakeholders identified problems of farmer's exposure to agrochemicals as a significant health concern when the study was first proposed. The research team presented study program planning to stakeholders. However, the research team consulted the community members in Khlong Seven at every point in the community process. Contacts with the Khlong Seven community included formats where discussion and questioning could occur. The implement design discussions were performed in the the Khlong Seven primary health unit and the Khlong Seven Meeting Center. It was anticipated that many times these discussions leaded to increased interest in the project. Community leaders of Khlong Seven community decided to become more involved, bringing their expertise as well as lending legitimacy to the project.

2.3 Research assistant training

Before implementing the intervention, the research assistants were recruited and conducted the trainer meeting for one week. The research assistants were the Khlong Seven Primary Care Unit Healthcare Workers; Khlong Seven Health volunteers. Training program for research assistant training included: introduction to the scope and contents of research project/ice-breaking activity; introduction to research assistant responsibility in research project (the responsible in each activity; preparatory phase, pre-implementation phase and, implementation); agrochemical safety education; how to assessment the households; role-playing for assessment the households; assessment the household practice; the first home assessment practice; review staff’s knowledge related to agrochemical safety and staff’s responsibility and; the second home assessment practice. In order to control inter-rater reliability and the standard of assessments during study period, however, before starting home assessment and other assessments, the research assistants were practiced again (before 1 day).

2.4 Preparation of materials and instruments

Materials and equipment for the training program were prepared including: flip charts and posters, pocket guides, and contact lists papers, pens, pencils, and game's equipment, videos. The instruments used for data collection such as interview form, training schedules, a camera, video recorder, notebook computer were prepared.

2.5 Pilot project

A pilot project was carried out in Bueng Ka Sam sub-district by using 30 purposive sampling subjects. The purpose of the pilot project was to try out the tools; and to develop in-home assessments using a specially developed home checklist to identify potential environmental, health and home safety hazards related to agrochemical safety.

3. Quasi-experimental phase (Implementation and evaluation or intervention phase)

This phase was a combination of 3 main steps including the first home assessment; community-based participatory activities regarding agrochemical safety; and the second home assessment. The details of activities mentioned in the intervention part.

3.5 Intervention Model Contents

The contents of the intervention were divided into 3 steps including: the first home assessment; community-based participation activities; and the second home assessment.

Step 1 The first home assessment

The first home assessment involved the identification of environmental hazards in and around the homes, educating the farmers on agrochemical safety, and other observed environmental health/home safety issues. During the first home assessment, which usually lasted for one to two hours, the following activities had been provided;

- Reading and explaining the consent form and obtain the client's signature if they agree to the home assessment.
- Administration the pre-test to the client.
- Providing education to the client on home safety, including agrochemical safety.

The "In Home Pesticide Safety Assessment" was included questions on wide range of environmental health topics relating to home safety. At the end of the first assessment, "In Home Pesticide Safety Assessment" was placed in a prominent position. The checklist provided local emergency numbers for the family's information and references.

Step 2 Community-based participation activities

The multi-approach model of intervention was developed to improve health safety and prevention from occupational agrochemical hazards among farmers in the study area. Community-based participatory action project was performed in Khlong Seven Rangsit sub-district, Khlong Luang disdrict. Community-based participation activities included: discussions on priority concerns related to agrochemical safety, problem-based, hands-on discovery learning from the first home assessment. Participating households also received individual assessments from the healthcare staff for assistance with safer storage of agrochemicals, and discussions of improved hygienic practices, such as those associated with post-application wash-up and separate laundering of contaminate clothing. Using popular education techniques such a mixed media format was used, incorporating directed discussion, in-depth interviews, focus group discussion, and role role-playing. These were included agrochemical storage areas adjacent to housing, improper disposal of pesticide containers near child play areas, and storage of soiled work clothes in living areas, practice mapping their worksites and using problem-solving skills to remedy problems (Wallerstein, 1993). Participants received additional copies of health education brochures, VCD. Educational project staff members had to invest the time to share their knowledge of the research and education process with the Khlong Seven community members, as these same project staff members ask community members to share their knowledge of the community, their experiences, and their beliefs. When the Khlong Seven community members are involved with implementation of the study, they become partners with the project staff and shared in the responsibility for the results and ultimate effectiveness of the study.

The activities were provided during the intervention stage including the Khlong Seven community key person in-depth interview and focus group discussion; broad awareness-raising activities including: community fairs, weekly radio spots and community participatory module activities 1-12 (created by the research team and Khlong Seven community key persons) including: ice breaking activities, Introduction to Agrochemicals, Health risks associated with agrochemicals, agrochemical safe handling and use, safety and health in the use of agrochemicals, agrochemical poisoning and management, environmental concerns, agrochemical material production, home agrochemical safety material production.

1) Activity1 focused on flipchart production, home agrochemical safety and material production.

2) Activity 2 focused on home agrochemical safety and material production.

3) Activity 3 focused on poster production and home agrochemical safety material production.

4) Activity 4 focused on handout production and home agrochemical safety material production.

Farmers often had difficulty getting time off from their work, so the schedule for the agrochemical safety program was held during non-work hours. The best times were generally weekends. Scheduling for meetings at Khlong Seven Rangsit Primary Care Unit Health care workers; Khlong Seven Rangsit Health volunteers; Khlong Seven Rangsit Sub-district leader (Kam-nan); Khlong Seven Rangsit Sub-district Administrative Organization officers and village leaders (Moo 1-Moo 9) in Khlong Seven Rangsit was also held during weekend.

The details of community-based participatory activities

Module 1: Introduction to Agrochemicals

Estimated time: 1:30 hours

Introduction to agrochemical concepts of focus, relevance, and control were highlighted in each section. The outline presented here illustrates how a program might be developed using a variety of educational materials and techniques. Use the blank flip chart to record responses, themes and ideas that arise from the discussion periods so that they can be referred to later in the session.

1. Introduction: introduce the educator and let the farmer participants introduce themselves. Describe the content of the occupational agrochemical health safety program and lead a short introductory discussion with the group.

Question: Do you work with agrochemicals?

Guide line of the answers:

1) Can you tell me more about the agrochemical safety?
2) Please list the different types and quantities of agrochemicals you use
3) Please list the names and addresses of the agricultural extension workers and primary health-care worker of the area.
4) Please give the examples and addresses of any other persons or organizations who can instruct you in the correct use

2. Discuss with the extension workers and community leaders how other users stock and use agrochemicals.

Question 1: Do they use other methods to control pests?

Guide line of the answers:

1) Can you find ways of using a small quantity of agrochemicals?

2) Could you also decrease your stock of agrochemicals?

3) Less stock means less investment at one time. There is also less chance of chemicals going to waste.

Question 2: Do you know anyone who was hurt or became sick working with agrochemicals?

Guide line of answers: What happened?

3. Fact Sheets: using the fact sheets or other visual aids, talk through the required concepts of agrochemical safety. Rather than lecturing the workers, ask questions such as “What do you in the pictures?”

4. Video: show the video, followed by a discussion the important points in video.

Discussion question:

1) What was the most interesting part of the case study in the video?

2) With which character could you identify?

3) What is the most important message of the video?

Module 2: Health risks associated with agrochemicals

Estimated time: 2:00 hours

Health risks associated with agrochemicals concepts of focus, relevance, and control were highlighted in each section. The outline presented here illustrates how a program might be developed using a variety of educational materials and techniques. Use the blank flip chart to record responses, themes and ideas that arisen from the discussion periods so that they could be referred to later in the session.

Module 3: Agrochemical Safe Handling and Use

Estimated time: 2:00 hours

Agrochemical safe handling and use concepts of focus, relevance, and control were highlighted in each section. The outline presented here illustrates how a program might be developed using a variety of educational materials and techniques. Use the blank flip chart to record responses, themes and ideas that arise from the discussion periods so that they could be referred to later in the session. The contents of this section focused on packaging, transportation, storage, dispensing, application, and spillage.

Module 4: Safety and Health in the Use of Agrochemicals

Estimated time: 1:30 hours

Safety and health in the use of agrochemical concepts of focus, relevance, and control were highlighted in each section.

This module concerned on the safety devices on the equipment that you use for agrochemical spraying; basic rules of personal hygiene of agrochemical safety, personal protective equipment,

Module 5: Agrochemical Poisoning and Management

Estimated time: 1:30 hours

Agrochemical poisoning and management concepts of focus, relevance, and control are highlighted in each section. The outline presented here illustrates how a program might be developed using a variety of educational materials and techniques. Use the blank flip chart to record responses, themes and ideas that arise from the discussion periods so that they can be referred to later in the session.

1. Discussion Issues involved fallen ill from working with agrochemicals; agrochemical products that caused these illnesses, first aid for emergency health effects from agrochemical hazards

Module 6-12: Agrochemical Safety Material Production

Estimated time: 2:00 hours per workshop

Introduction to Basic principles of good agrochemical safety material production including: agrochemical safety VDO clip; agrochemical safety handout;

agrochemical safety education brochures; flip charts, agrochemical safety online web link; and agrochemical safety posters.

Brainstorming technique was used by farmer participants to bring out the ideas of each individual and present them in an orderly fashion to the rest of the team. The key ingredient was to provide an environment free of criticism for creative and unrestricted exploration of options or solutions related to agrochemical safety. The research team set a time limit for brainstorming related to agrochemical safety material production, assigned a timekeeper and data recorder, and started the clock.

Pointing to each idea on the chart pack in turn, ask the participants whether they have any questions about its meaning. The research team summarized and modified all ideas. The summarized idea contents of agrochemical safety from Khlong Seven Rangsit community were appeared in handout; education brochures; webpage and; posters and VDO.

Table 3.3 Time of the activities

Duration	Activities
Meeting 1	Khlong Seven Rangsit Sub-district Administrative Organization officer Khlong Seven Rangsit Primary Care Unit Health Care Workers in-depth interview and focus group discussion
Meeting 2	Khlong Seven Village leaders (Moo 1-Moo 9) in-depth interview and focus group discussion
Meeting 3	Ice breaking activities/Introduction to Agrochemicals
Meeting 4	Health risks associated with agrochemical
Meeting 5	Agrochemical Safe Handling and Use
Meeting 7	Agrochemical Poisoning and Management
Meeting 8	Environmental concerns, Scope of agrochemical safety
Meeting 9-12	Agrochemical Safety Material Production
Meeting 13	Evaluation and Conclusion study project

Final material products from this phase included; case study of agrochemical risk behavior video clip; agrochemical safety behavior booklets; agrochemical safety flip charts; agrochemical safety posters; agrochemical safety online web link.

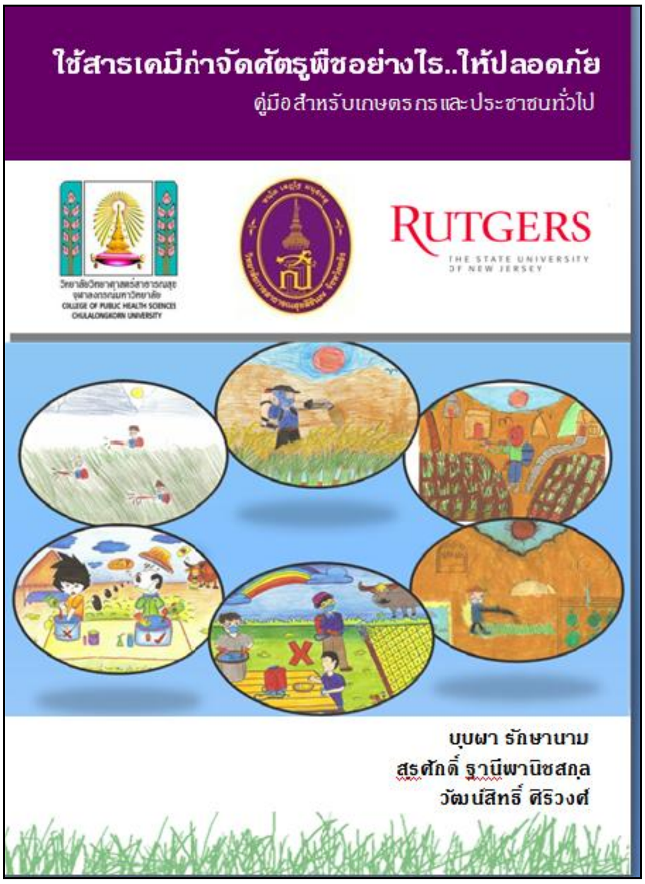

Figure 3.4 Agrochemical safety guideline Booklets

The contents of the booklets involved and focused on basic guidelines for protecting farmers from agrochemical harmful. These booklets were distributed to all farmer participants. These were also provided in the Khlong Seven primary health unit and the Khlong Seven sub-district administrative organization. The contents in the booklets used language was easy to understand. The drawing pictures in the booklets come up with the Khlong Seven community participant's ideas.

Figure 3.5 Case study of agrochemical risk behavior video

The scope of this video involved the risk behaviors during spraying pesticides: nozzle was clogged while the farmer spraying agrochemicals. In the Video showed the acute health effect caused from pesticide exposure. The actors were farmer participants in the Khlong Seven community. This video has been uploaded to the Khlong Seven sub-district administrative organization (http://www.klong7.go.th/) and the Youtube website (http://www.youtube.com/watch?v=eg4dSGJuQGA). This video was developed by the Khlong Seven community ideas.

Figure 3.6 Flip charts

Agrochemical flip charts focused on basic guidelines for protecting farmers from agrochemical harmful. These were provided in the Khlong Seven primary health unit and the Khlong Seven sub-district administrative organization.

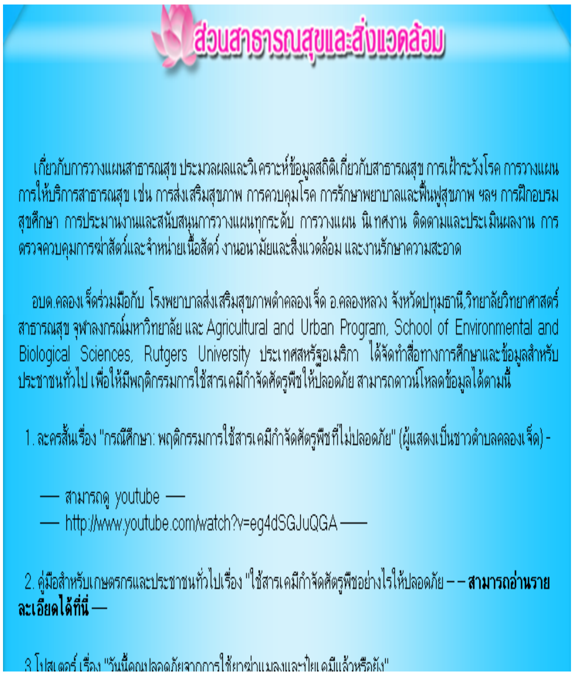

Figure 3.7 The Khlong Seven community agrochemical safety web links

The Khlong Seven community agrochemical safety web link has been provided in the Khlong Seven sub-district administrative organization. The web links presented as follow:

1) http://www.klong7.go.th/default.php?modules=news&data=detail&Id=22
2) http://www.klong7.go.th/default.php?modules=fckeditor&fck_id=18&view_id=97&orderby=1
3) http://www.klong7.go.th/default.php?modules=activity&data=list

Figure 3.7 Agrochemical safety behavior guideline posters

Agrochemical safety behavior Posters focused on basic guidelines for protecting farmers from agrochemical harmful. These were provided in the Khlong Seven primary health unit and the Khlong Seven sub-district administrative organization.

Step 3 The second home assessment

The second home assessment involved the observation of the farmer's behavior changes towards their ability to reduce the risk of agrochemical exposures within their home. The second home assessment was done by the researcher and healthcare staffs at least 6 months after the initial assessment and lasted one to one and a half hours. The research team conducted a visual observation of the home for any changes the client might have made, based on the recommendations suggested to improve home safety during the first home assessment. This information was noted on the original Home Assessment. In addition, the healthcare staffs administered the post-test to the client during the second home assessment, discuss problem solving in which the healthcare staffs had engaged, and agrochemical safety and other health related issues that had arisen. Research team also provided additional printed materials as necessary.

3.6 Measurement tools

Content validity and reliability of questionnaire were verified by 5 specialists and experts on environmental health, community health, behavior and social sciences. Then, questionnaire was adjusted after getting the recommendations from the experts. A pilot project was carried out in Bueng Ka Sam community by using 30 purposive sampling subjects. They were tested prior to the research performed. Then the questionnaires were verified concerning reliability using coefficient alpha of Cronbach. After that, the questionnaires were adjusted appropriately. The Cronbach's alpha coefficients of health beliefs, behaviors, home assessment on agrochemical use, and spider-gram community participation questionnaires were 0.76, 0.81 and 0.62 respectively.

The research instruments included knowledge on agrochemical use questionnaire, health belief on agrochemical use questionnaire, agrochemical use behavior questionnaire, home's pesticide safety assessment, spider-gram of community participation, and qualitative questionnaire. The measurement tools were separated to 7 sections including;

1. Interview form of survey general data which included socio-demographic information: age, education, marital status, religious, occupation, income, years have you used pesticides, years working in farming and medical history (Appendix F, part 1).

2. Questionnaire of knowledge on occupational agrochemical safety, which the contents of questionnaire included: knowledge and understanding before, meanwhile, after handling agrochemicals; proper storage of agrochemicals; and environment and agrochemical effects (Appendix F, part 2).

3. Questionnaire of health belief on agrochemical safety. The contents of questionnaire included: perception toward susceptibility, severity, benefits of agrochemical safety and barriers to improving agrochemical safety (Appendix F, part 3).

4. Questionnaire of behaviors regarding on agrochemical safety. The contents of questionnaire related an environmental, health and protective behavior issues (Appendix F, part 4).

5. Spider-gram questionnaire of community-based participation included measuring community participation focused on need assessments, leadership, resource mobilization, organizational factors, and community management regarding agrochemical safety behaviors (Appendix F, part 5).

6. In home pesticide safety assessment involved the identification of pesticide safety behaviors in and around their home (Appendix F, part 6).

7. Qualitative interview guidelines included: observation guideline, in-depth interview guideline, and focus group discussion guideline. Qualitative interview guidelines explored: agrochemical use in the Khlong Seven community; environmental health risks regarding agrochemical exposure and; recommendations for establishing a rice farmer guideline for improving pesticide safety in Khlong Seven community (Appendix G).

The effectiveness of the intervention program was monitored by the changes of mean scores of knowledge, belief, behavior, assessment of the home's pesticide safety, and spider-gram of community participation regarding agrochemical safety behaviors.

Section 1 knowledge on agrochemical safety

The knowledge on agrochemical use questionnaire consisted of basic knowledge of agrochemical safety behaviors. All of 22 questions in this part were 4 multiple-choice answers. The examples of the questions were: How are you exposed from agrochemicals especially pesticides? What is the dangerous of agrochemical especially pesticides? What are the most important points to consider when choosing agrochemicals? What should you do, if the nozzle is clogged while you are spraying agrochemical especially pesticide? How should you have the method to get rid of agrochemical containers?

All of 22 questions were 4 multiple-choice answers scored as follow;

Correct answer obtaining	1	score
Incorrect answer obtaining	0	score

Missing answer obtaining 0 score

Possible scores were ranged between 0-22 score. Scores of knowledge were classified into 3 groups by using Bloom's Theory (Bloom et al., 1956). The scores were sum up. Then, they were classified by percentage, ≤ 60.00 % was low level, >60.00 % - 80.00 % moderate, and > 80.00 % high level as follow.

Score	Level
0-13	Low
14-17	Moderate
18-22	High

Section 2 Belief on agrochemical scores

The health belief on agrochemical use questionnaire was divided into 4 sections including perceived susceptibility, severity, benefits, and barriers to using agrochemicals. The questions were both positive and negative (22 questions). Each question was scored on a five-point Likert's scale, ranging from strongly agree, agree, uncertain, disagree, and strongly disagree. The examples of health beliefs on agrochemical use were: Long term exposure to agrochemical especially pesticide can affect the nervous system**;** Used pesticide containers can be washed and reused for cooking; The person who is allergic to agrochemical may have potentially dangerous complication of other diseases more easily; For your safety, you should always read agrochemical instructions before using; To reduce the risk of exposure from agrochemical especially pesticides, you should spray the same direction with the wind; Providing complete personal protective equipments such as hat, gloves, boots, mask, etc. to protect the danger should be set but it is trouble. So it is rarely used.

Strongly agree meant the farmers thought that the message was correspond with his feeling, opinion or belief following his perception most.

Agree meant the farmers thought that the message was correspond with his feeling, opinion or belief following his perception.

Neutral meant the farmers were uncertain with the message in that sentence which was corresponding against to his feeling, opinion or belief with perception.

Disagree meant the farmers thought the message opposes his feeling, opinion or belief with perception.

Strongly disagree meant the farmers thought the message opposes all of his feeling, opinion or belief with perception

The farmers could choose one choice and the criterion of the measurement present as follow:

	Positive statements	**Negative statements**
Strongly agree	5 scores	1 score
Agree	4 scores	2 scores
Neutral	3 scores	3 scores
Disagree	2 scores	4 scores
Strongly disagree	1 score	5 scores

A scoring criteria and evaluation standard total score were classified and apply into three categories as follow (Seri, 1993):

Negative belief:	Score = 0.00-59.99%
Neutral belief:	Score = 60.00-79.99%
Positive belief:	Score = 80.00-100%

2.1) Possible scores of perceived susceptibility to agrochemical hazards were ranged between 0-35 score.

Negative belief:	Score = 0.00 - 20.99 (0-59.99%)
Neutral belief:	Score = 21.00 - 27.99 (60-79.99%)

Positive belief: Score = 28.0 - 35.0 (80-100%)

2.2) Possible scores of perceived severity to agrochemical hazards were ranged between 0-20 scores.

Negative belief : Score = 0.00-12.99 (0-59.99%)

Neutral belief : Score = 12.00-15.99 (60-79.99%)

Positive belief : Score = 16.00-20.00 (80-100%)

2.3) Possible scores of perceived barriers for improving agrochemical safety were ranged between 0-25 scores.

Negative belief : Score = 0.00-14.99 (0-59.99%)

Neutral belief : Score = 15.60-19.99 (60-79.99%)

Positive belief : Score = 20.00-25.00 (80-100%)

2.4) Possible scores of perceived benefit of agrochemical safety were ranged between 0-25 scores.

Negative belief: Score = 0.00-14.99 (0-59.99%)

Neutral belief: Score = 15.60-19.99 (60-79.99%)

Positive belief: Score = 20.00-25.00 (80-100%)

2.5) Possible score of total belief on agrochemical safety were ranged between 0-105 scores.

Negative belief: Score = 0-62.99 (0-59.99%)

Neutral belief: Score = 63.00-83.99 (60-79.99%)

Positive belief: Score = 84.00-105.00 (80-100%)

Section 3 Behavior on agrochemical safety scores

The agrochemical use behavior questionnaire comprised 20 questions, specifically, self-care practice in personal health and questions concerning self-care practices (before, meanwhile and after handling agrochemicals). The farmers had to choose one answer from each question on a four-point, Likert's scale which included always done, often done, sometimes done, and never done. The examples of agrochemical use behaviors were: Check the tools and equipment before working; Use an expired agrochemical; Leave the food near/in the spraying area; Breath test to check whether the agrochemical is real or fake; Throw out the empty or expired containers in normal trash; Store agrochemicals in a locked area.

Always done**:** farmers perform the dangerous protection activities from agrochemicals every time when they work with agrochemicals;

Often done**:** farmers almost perform the dangerous protection activities from agrochemicals when they work with agrochemicals or the time of doing activities are between 5-9 times from 10 times of using agrochemicals;

Sometimes done: farmers sometimes perform the dangerous protection activities from agrochemicals when their work related agrochemicals or the time amount of doing activity are not over 4 from 10 times of for using agrochemicals;

Never done**:** farmers never perform the dangerous activities related to agrochemical exposure

All individual points were sum up for a total score, means and standard deviations were calculated. Possible scores were ranged between 0.00-60.00 score. Scores of behavior regarding agrochemical exposure classified into 3 groups by using Bloom's Theory (Bloom et al., 1956). The scores were sum up. Then, they were classified by percentage, ≤ 60.00 % was low level, >60.00 % - 80.00 % moderate, and > 80.00 % high level. The farmers could choose one choice and the criterion of the measurement was as follow:

	Positive statements	Negative statements
Always done	4 scores	1 scores
Often done	3 scores	2 scores
Sometime done	2 scores	3 scores
Never done	1 score	4 scores

Section 4 home pesticide safety assessment scores

The home pesticide safety assessment involved the identification of agrochemical safety behaviors in and around their home. The answers of 12 questions were “yes” or “no”. The examples were: Leave agrochemicals in the bathroom; Leave agrochemicals in the bathroom; Leave agrochemicals in the kitchen room; Store agrochemicals in a safety and locked room; Provide hazardous trash and general trash; Provide the call numbers of hospitals, health centers, toxicological centers (in case of an emergency from agrochemical hazardous).

The total number of question in this section was 12 questions. The answers of each question were “yes” or “no”. The answers were scored as follow;

“Yes” answer obtaining	1	score
“No” answer obtaining	0	score
Missing answer obtaining	0	score

Possible scores were ranged between 0.00-12.00 score. Scores of home pesticide safety assessment were classified into 3 groups by using Bloom’s Theory (Bloom et al., 1956). The scores were sum up. Then, they were classified by percentage, ≤ 60 % was low level, >60.00 % - 80.00 % moderate, and > 80.00 % high level as follow.

Score	Level
0.00 - 7.199	Low
7.20 - 9.59	Moderate
9.60 - 12.00	High

Section 6 Community participation regarding agrochemical safety scores

Community participation involved measuring community participation related to needs assessment, leadership, resource mobilization, organizational factors, and management. The total number of question in this section was 8 questions. Ranking scale for measuring community participation in five process dimensions was presented in table 3.7 (Rifkin, et al, 1988).

Table 3.4 Ranking scale for measuring community participation in five process dimensions (Rifkin SB, et al, 1988)

Score / Dimension	**Minimal (score = 1)**	**Restricted (score = 2)**	**Fair (score = 3)**	**Open (score = 4)**	**Maximal (score = 5)**
Leadership	Community-based leadership represents only the wealthy minority and acts only in their interest	No collaboration among community-based leadership for community health; A health leader! Worker appointed by outside expert works independent of social interest groups	There is some collaborating community-based leadership functioning under an outside expert - appointed health leader/worker	Community-based leadership represents different groups in the community, is active and takes initiative in community health activities	Community-based leadership represents the variety of interests in the community and has ownership/control of community health activities

Table 3.3 Ranking scale for measuring community participation in five process dimensions (Rifkin, et al, 1988)

Score / Dimension	**Minimal (score = 1)**	**Restricted (score = 2)**	**Fair (score = 3)**	**Open (score = 4)**	**Maximal (score = 5)**
Organization	Outside expert does not use a community-based organization, or imposes one for project, which then remains inactive	Outside expert imposes a community-based organization or committee, but this organization develops some activities	Outside expert imposes a community-based organization, but this organization becomes fully active	Existing community organizations actively cooperate in community health activities	Existing community organizations, representing a broad constituency, incorporate or create their own mechanisms for introducing community health activities.
Needs assessment	Outside expert solely projects possible problems or conducts survey	Outside expert viewpoint dominates but community interests are considered, often through input of community-based leadership	Community-based leadership assessment of community views and needs dominates	Community-based leadership is actively involved in seeking out community members' viewpoints	Community members involved in research and analysis of needs under active community-based leadership direction
Management	Activities induced by outside expert. Only outside expert conducts supervision of activities	An outside expert – appointed health leader/worker manages independently, under supervision of outside expert	Community-based leadership involved to some extent in management of activities but without control of activities	Community-based leadership is self-managed and involved in supervisor of activities	The activities and supervision of the activities are the responsibility of the community-based leadership
Resource mobilization	Token amount contributed by community. Community-based leadership does not decide on any resources allocation	Mechanism established for resource generation, but community-based leadership has no control over use of resources	Continuing contribution of local resources, but no or limited community-based leadership control of resources	Continuing contribution of local resources, and community-based leadership controls use of funds	Considerable resources contributed by community or obtained otherwise by community-based leadership. Community-based leadership allocates available resources

6.1) Possible scores of need assessments were ranged between 0-15 score. Scores of needs assessments were classified into 3 groups by using Bloom's Theory (Bloom et al., 1956). The scores were sum up. Then, they were classified by percentage, ≤ 60 % was low level, >60 % - 80 % moderate, and > 80 % high level as follow.

Score	Level
0.00 – 8.99	Low
9.00 - 11.99	Moderate
12.00 - 15.00	High

6.2) Possible scores of leadership participation were ranged between 0-10 score. Scores of leadership participation were classified into 3 groups by using Bloom's Theory (Bloom et al., 1956). The scores were sum up. Then, they were classified by percentage, ≤ 60 % was low level, >60 % - 80 % moderate, and > 80 % high level as follow.

Score	**Level**
0.00 – 5.99	Low
6.00 - 7.99	Moderate
8.00 - 10.00	High

6.3) Possible scores of resource mobilization were ranged between 0-5 score. Scores of resource mobilization were classified into 3 groups by using Bloom's Theory (Bloom et al., 1956). The scores were sum up. Then, they were classified by percentage, ≤ 60 % was low level, >60 % - 80 % moderate, and > 80 % high level as follow.

Score	**Level**
0.00 – 2.99	Low
3.00 - 3.99	Moderate
4.00 - 5.00	High

6.4) Possible scores of organization participation were ranged between 0-10 score. Scores of organization participation were classified into 3 groups by using

Bloom’s Theory (Bloom et al., 1956). The scores were classified by percentage, ≤ 60 % was low level, >60 % - 80 % moderate, and > 80 % high level as follow.

Score	**Level**
0.00 – 5.99	Low
6.00 - 7.99	Moderate
8.00 - 10.00	High

6.5) Possible scores of Management were ranged between 0-5 score. Scores of Management were classified into 3 groups by using Bloom’s Theory (Bloom et al., 1956). The scores were classified by percentage, ≤ 60 % was low level, >60 % - 80 % moderate, and > 80 % high level as follow.

Score	**Level**
0.00 – 2.99	Low
3.00 - 3.99	Moderate
4.00 - 5.00	High

Section 7 Focus group discussion guideline

Focus group discussion guideline explored: agrochemical use in the Khlong Seven community; environmental health risks regarding agrochemical exposure and; recommendations for establishing a rice farmer guideline for improving pesticide safety in Khlong Seven community. The examples of focus group discussion guidelines were: What belief systems influence the farmers’ perceived risk of agrochemical exposure? What are farmer’s beliefs regarding the severity, susceptibility, barriers and benefits of agrochemical exposure? What observed work-related and socio-cultural factors modify agrochemical exposure risks? What are the needs of farmers to improve agrochemical safety in the Khlong Seven community? What are recommendations for establishing a rice farmer guideline for improving agrochemical safety in Khlong Seven?

3.7 Data collection

Data collection from the rice farmers was completed by incorporating a mixed-method of quantitative and qualitative research methods.

The qualitative part (community-based ethnography part) includes open-ended interviews, focus group discussion and observation. An open-ended interview schedule was used to guide the interviews and focus group discussions. The interviews and focus group discussions were performed by research team who were trained in interviewing techniques and briefed on the interview and discussion topics. The research team members included professors of public health and health sciences, medical doctor and healthcare workers, nurses, healthcare volunteers who had worked and lived in the study area over the study period. The researchers had worked in the health science research unit for many years. We were given instructions in listening skills and took part in role-playing exercises, being flexible when necessary, accepting all ideas and opinions as valid, understanding, being non-judgmental, and sensitive to individuals who did not want to reveal information. Semi-structured, and unstructured, open-ended interviews were performed in the farmer participants' own homes and their work sites. Unstructured interviews, informal discussions were used to gain rapport with the participants. In semi-structured interviewing, an interview guide of questions was used. Questions focused on belief and behavior of agrochemicals, beliefs regarding health risks associated with agrochemical exposure, safety practices in the work site, safety practices at home, and beliefs about work-related conditions that contribute to agrochemical exposure. Semi-structured interviews were audio recorded, and a unique identifier was recorded in place of the participant's name. All interviews were lasted between 1 and 2 hours, the average been 1.5 hours. Focus group discussions and in-depth interviews were done in a private and quiet place such as a primary health care unit and the Khlong Seven community leader’s office. Observational data was collected by working alongside farmers in their rice farms and in their homes in the Khlong Seven community. We took field notes on what we saw, heard, and experienced. For examples, we took notes on the configuration of work groups, what work was performed and by whom, the types of agrochemical exposure and the protection the farmers used. The research team also recorded observational data on the conditions inside farmers’ homes, their work sites and decontamination activities such as taking showers, hand washing and changing work clothes.

Quantitative data included background data and general data of health risk Knowledge, belief and behavior were collected by face to face interview with questionnaires. Observation environment of workplace and characteristic of work activities by observation form and the component of agrochemical risk behaviors.

3.8 Data analysis

1.Descriptive statistics including frequencies and percentages were used for demographic and occupational data. Mean and Standard deviation were used for scoring, knowledge, belief and behavior changes related to occupational agrochemical safety.

2. Chi-square, *t*-test, and paired-*t* test were used to evaluate differences of characteristics between experimental and control groups and to evaluate changes of participant’s knowledge, belief, and behavior.

3. P of 95% confidence was 0.05 and analysis was be performed by SPSS 17 for windows.

4. Content analysis was used for the qualitative data. Qualitative data were analyzed by systematically organizing and interpreting information using categories, themes and motifs that identify patterns and relationships. We identified patterns and relationships on which to base on analysis of the findings. The data obtained were transcribed and crosschecked with respondents before analyzing. This approach strengthened the text-analysis process, allowing the data to be reviewed with greater familiarity and within the context in which it was collected. The codes from all of the interviews were then grouped into categories by similarity, and the transcripts were recoded using the unified, grouped set of codes based on the code categories. Researcher then reviewed sentences, phrases, and paragraphs surrounding coded text, in conjunction with memos and field notes, to identify common themes emerging from the data. The research team then met to review all the themes that were identified. If there was disagreement about a theme or key words, the items were discussed until consensuses were reached. To maintain the richness of the information obtained during the interviews we extracted exemplars to illustrate key themes. In a study such as this it is customary to present direct quotes from participants to illustrate their specific views. Quotes representing prevailing interpretations, views, and themes were given. Where divergent opinions were expressed, they were noted in the text. We then reviewed the interview transcripts, debriefing summaries, and detailed field notes in their entirety. Finally, we selected narratives that portrayed each theme for inclusion here in order to give voice to the farmer participants' stories. To develop a

category system, the content of the transcripts was analyzed to identify common themes and points for further discussion.

3.9 Ethical consideration

The study protocol was approved according to Chulalongkorn University Ethics Committee review guidelines for the protection of human subjects (Protocol No.041.2/53). Information collected was kept confidential by using numbers and codes. Furthermore, written informed consent was obtained from the farmer participants prior to conducting any study-related procedures (Appendix A-E).

CHAPTER IV
RESULTS

The research results are presented as three parts: a cross-sectional study and a quasi-experimental phase evaluation.

4.1 Phase 1: Cross-sectional study

4.1.1 Personal characteristic of the participants in phase 1 (482 rice farmer participant)

A majority of the farmer participants (54.36 %) were male. The average age of the individuals was 46.53 years and 41.08 % were between from 41 to 50 years old. Most of them (58.78%) were married. Most were primary school educated (45.44%). Most of them (90%) stated that they were involved in pesticide spraying during their work sites, more than half of been working with having worked with pesticides for over 10 years. Most of them (51.42%) rented the farms where they worked. Some of them owned the land for farming, and the others rented for working. Most of them had been involved in agricultural labor for 30.53 years (Table 4.1). The majority of the samples sprayed pesticides four times (48.62%) per month, followed by three times, twice, and once per month (35.97%, 12.15%, and 3.26%, respectively).

Table 4.1 Demographic and socio-economic characteristics of the rice farmer participants

Characteristics (n = 482)	Number (Total = 482)	Percentage (%)
Gender		
Male	262	54.36
Female	220	45.64
Age (Years)		
≤ 30	34	7.05
31-40	79	16.39
41-50	198	41.08
51-60	171	35.48
> 60	0	0.00
Mean ± SD = 46.53 ±11.19		
Range = 21 – 60		
Marital Status		
Single	112	23.24
Married	283	58.71
Widow	50	10.37
Divorced	37	7.68
Education		
Uneducated	-	0.00
Primary school	219	45.44
Secondary school	208	43.15
Under Bachelor degree	48	9.96
Bachelor degree & higher	7	1.45

Table 4.1 Demographic and socio-economic characteristics of the rice farmer participants (con't)

Characteristics (n = 482)	Number (Total = 482)	Percentage (%)
Income (Bath/Month)		
≤ 3500	32	6.64
> 3,500 – 5,000	54	11.20
> 5,000 - 10,000	301	62.45
> 10,000-20,000	85	17.63
> 20,000	10	2.07
Mean $\underline{+}$SD = 6,988.35$\underline{+}$3,511.10 baht		
Duration in agriculture occupation		
Mean + SD = 30.53 + 11.19 years		
Range = 1- 55 years		
Type of ownership		
owner	148	30.71
renter	248	51.45
Owner and renter	47	17.84

Major factors of health risk behaviors related to pesticide exposure in the Khlong Seven community caused from the misuse of pesticides including erroneous beliefs of farmers about pesticide toxicity, lack of attention to safety precautions, environmental hazards, and information about first aid and antidotes given by the label, the use of faulty spraying equipment or lack of proper maintenance of spraying equipment, and protective gear and appropriate clothing during handling of pesticides. More than half of the farmer participants applied higher than recommended concentrations and did not pay any or very little attention to labels on the chemicals and protective clothing instructions. The farmers breathed air containing pesticides as a vapor or aerosol during spraying. They sprayed with another person working close by and would be carried by the wind. Drinking water was often left on their work site which was often very close to spraying area. They directly handled pesticides with their hands. The pesticides were also exposed to their eyes because of improper personal protection such as visors or splash proof goggles. They poured pesticide directly into a spray tank without rubber gloves. Another problem was they often stored the pesticide equipment in their houses, not in a locked storage area. This storage was often close to other household activities and where the children were able to access the storage area. The major sources of waste chemicals and solid wastes were through contamination including defective and expired bottles and pesticide’s containers. The waste chemical drums and different contaminated solid waste were not placed on impervious floors. This had the potential to cause contamination of soil, groundwater, cannels, and reservoirs from the leakage and spillage. In most cases, the farmers disposed the empty pesticide containers within the farm (89.94%) by selling, leaving it in the field, or reutilization for other purposes (e.g., for food and water storage). On some farms, the empty containers were taken to the local waste containers or to a pesticide container disposal facility. Most of the farmers reported working 8–10 hours a day during the growing season, with pesticide application occurring for 3–8 days each month. Almost all farmers (66.67%) had an area outside the farmhouse for storage of the pesticide products, while the rest reported storing these products inside their houses.

Figure 4.1 Risk behaviors regarding agrochemical exposure (Photo by Buppha, 2010)

Acute pesticide poisoning symptoms mostly found in the Khlong Seven community included nausea, vomiting, dizziness, skin irritation, skin rash, nasal irritation, weakness and eye irritation, headache, fainting and fatigue.

Figure 4.2 Farmer got an acute health effects (abdominal pain, dizziness) which caused by organophosphate exposure during spraying pesticide (Photo by Buppha, 2010).

Most of the farmers reported using pesticide products containing the organophosphate pesticide as active ingredient. The next most frequently used active ingredient was carbamate. Among the herbicides, glyphosate was most frequently mentioned. The most popular brand name of pesticide in the Khlong Seven community was “Abamectin”. Abamectin is dominant insecticide that rice farmers use in Thaiand. It has high toxicity to some insects such as bees and hymenopteran parasitoids. Abamectin attacks the nerve system of insects and mites, causing paralysis within hours. In addition, there were two local agrochemical shops in Khlong Seven community. The big agrochemical shops were located at Village 9. Additionally, another place was located at Village 2.

Figure 4.3 Examples of pesticides found in the Khlong Seven community

There were four categories of pesticides found in the Khlong Seven community. Organophosphate, cabamates, organochlorines, and Pyrethroids/others had been revealed in the study area.

Table 4.2 Level of health beliefs scores regarding agrochemical exposure (482 rice farmer participants)

Health beliefs (total score = 5)	**Mean**	**SD**
1. Perceived susceptibility to agrochemical hazards	3.88	0.77
2. Perceived seriousness or severity of agrochemical hazards	4.35	0.38
3. Perceived the protective barriers for improving agrochemical safety.	3.29	0.36
4. Perceived benefits of agrochemical safety	3.31	0.31
Total health belief	3.62	0.26

Farmers had a neutral level of total belief regarding agrochemical use. The level of total average health belief regarding agrochemical exposure was 3.62. They had neutral levels of perceived susceptibility to agrochemical hazards, perceived the protective barriers for improving agrochemical safety, and perceived benefits of agrochemical safety. The belief concerning the perceived of severity of agrochemicals was high (positive belief) (Table 4.2 and figure 4.4).

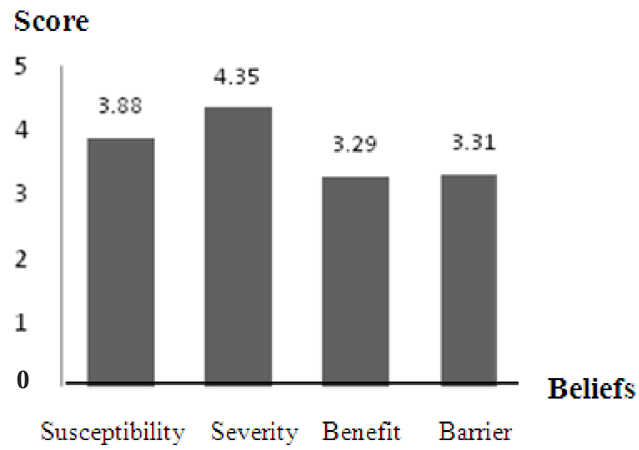

Figure 4.4 Level of health beliefs regarding agrochemical exposure

Table 4.3 Level of behavior scores regarding agrochemical exposure (482 rice farmer participants)

Agrochemical use behaviors (total score = 4)	Mean	SD
1. Healthy Personal care	3.12	0.71
2. Using personal protective Equipment	2.39	0.48
Total behavior	2.77	0.52

They had a moderate level of total behavior regarding agrochemical safety and a moderate level of healthy personal care behavior. The score of total behavior regarding agrochemical safety was 2.77. The level of use of personal protective equipment was low.

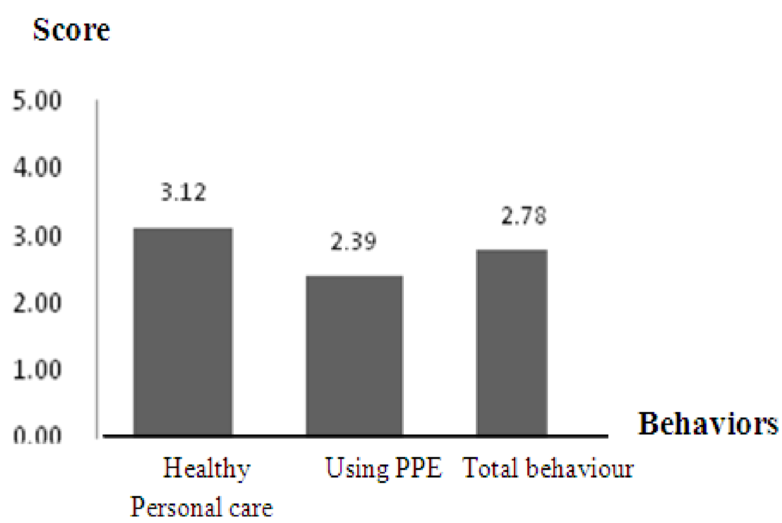

Figure 4.5 Level of behaviors regarding agrochemical uses

Table 4.4 Multiple regression analysis regarding to agrochemical use behavior and health beliefs

Factors	B	SD	Beta	T	Sig.
Constant	1.89	.313		6.05	.000
Perceived severity to agrochemical hazards	.398	.024	.595	16.29	.001*
Perceived susceptibility of agrochemical hazards	-.015	.049	-.011	-.307	.759
Perceived the protective barriers of improving agrochemical safety	-.165	.055	-.116	-2.98	.053
Perceived benefits of agrochemical safety	-.018	.054	-.013	-.338	.735

** Significant level at 0.05

However, their behaviors regarding agrochemical safety, especially related to the use of proper personal protective equipment, were at a remarkably low level. Multiple regression analysis regarding to agrochemical use behavior and health beliefs showed that high perceived severity of agrochemical hazards was also correspondingly high ($p<0.05$) (Table 4.4).

The potential agrochemical exposure especially pesticide exposure pathways among the rice Khlong Seven community included: (1) take-home agrochemicals resulting from pesticide residues on clothing, skin, and boots that accumulated as farmers were working in fields; (2) ingestion from food intake that might contain pesticide residues in foods such as fruit, vegetables or drinking water; (3) environment causes, especially if the family home was close to the farms caused by agrochemical spray or spray drift; (4) a major concern was the farmers' unsafe methods of mixing, loading and applying the pesticides. Health risk behaviors regarding agrochemical exposure especially pesticide exposure in the Khlong Seven community mainly caused from the misuse of pesticides including erroneous beliefs of farmers on pesticide toxicity, lack of attention to safety precautions, environmental hazards, and information about first aid and antidotes given by the label, the use of faulty spraying equipment or lack of proper maintenance of spraying equipment, and protective gear and appropriate clothing during handling of pesticides. The farmers breathed air containing pesticides as a vapor or aerosol during spraying. Sometimes they sprayed with another person working close by and would become from the spray carried on the wind. Drinking water was often left on their work site which was often very close to spraying area. They directly handled pesticides with their hands and the pesticides were also exposed to their eyes because of improper personal protection such as visors or splash proof goggles. They poured pesticide directly into a spray tank (without rubber gloves).They often stored the pesticide equipments in their houses, where the children were able to access the storage area. They often stored the pesticide equipment in their houses, in an unlocked storage area. This storage was often close to other household activities and where the children were able to access. The major sources of waste chemicals and solid wastes were through contamination including defective and expired bottles and pesticide's containers. The waste chemical drums and different contaminated solid waste were not placed on impervious floors. Acute pesticide poisoning symptoms were mostly found in the Khlong Seven community and included nausea, vomiting, dizziness, skin irritation, skin rash, nasal irritation, weakness and eye irritation, headache, fainting and fatigue. One rice farmer participant who was a middle age man reported that, "I think there is much more awareness of pesticides now than there had been over 30 years ago". They agreed that pesticides helped protect crops but resulted in ill effects for farmers. Although, many farmers knew that regulations existed to protect them from pesticide exposure more than 80% said there was little to no enforcement of the regulations. Regarding protective clothing, the response by one farmer exemplified the view expressed by many other farmers: "personal protective equipments, which were supposed to be worn in some job capacities were hot and uncomfortable and were rarely provided".

4.2 Phase 2 Quasi-experimental study (Implementation and evaluation phase)

The baseline comparisons of the demographic characteristics between study and control groups were not significantly different ($p>0.05$). The majority of the farmer participants (54.5%) were male. The average age of the individuals was 49.91 years old. The age range of the sample was 22-60 years. Most of them (72.30%) were married. Most were primary school educated (55.4%). Average income was 6,702.97 baht per month. Most of them (66.30%) rented the farms where they worked. Some of them (23.2%) owned the land for farming, and the others rented and owned the farm for working. Most of them had been involved in agricultural labor for an average of 20.48 years (Table 4.5).

Table 4.5 Demographic and socio-economic characteristics of the rice farmer participants in study and control groups

Characteristic	Total (n = 101)		Study (n = 50)		Control (n = 51)		P-value
	N	%	n	%	n	%	
Gender							
Male	55	54.50	27	54.0	28	54.9	0.543
Female	46	45.50	23	46.0	23	45.1	
Age (Year) Mean ±S.D.	44.91±10.29		44.86 ±10.39		44.96±10.31		0.960
Marital status							
Single	7	6.9	6	12	1	2	
Married	73	72.3	36	72.0	37	72.5	0.176
Widow	11	10.9	3	6.0	8	15.7	
Divorce	7	6.9	4	8.0	3	5.9	
Separate	3	3.0	1	2.0	2	3.9	
Education							
Uneducated	0	0	0	0	0	0	
Primary school	56	55.4	31	62	26	51	
2nd school (Gr7-9)	11	10.9	2	4	8	15.7	
2nd school (Gr10-12)	20	19.8	10	20	10	19.6	0.545
Certificate	8	7.9	4	8	4	7.8	
Bachelor degree	4	4.0	2	4	2	3.9	
Others	2	2	1	2	1	2.0	
Income (Baht)							
Mean ± S.D.	6,702.97± 2,099.02		6,830.00±2,406.64		6,578.43±1,761.74		0.550
Median	6,000		6,000		6,000		
Type of ownership							
Renter	63	66.3	31	70.5	32	62.7	
Renter and owner	10	10.5	2	4.5	8	15.7	0.210
Owner	22	23.2	11	25	11	21.6	
Missing data	6		6				
Duration in agriculture occupation (year) Mean±SD	20.48±13.19		20.38±13.29		20.58±13.22		0.943

Rice farming was a primary occupation in Khlong Seven community. In farming season, most of them spent 10-12 hours a day during the day time in the field seven days a week. They also worked in the field all day in different seasons of farming. In addition, they worked as labors in the factories in Pathumthani provice or Bangkok during no farming seasons. Agrochemical Backpack sprayer was the most application method in Khlong Seven community.

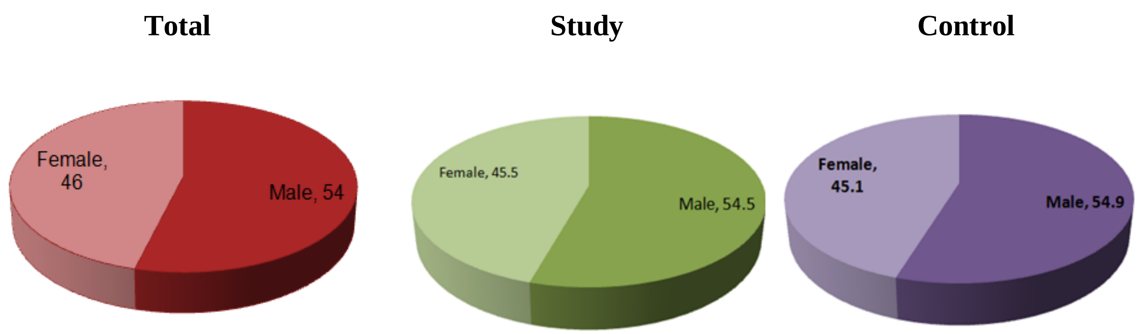

Figure 4.6 Comparison of the sex between study and control groups

The baseline comparison of the sex between study and control groups were not significantly different (p = 0.54). The majority of the farmer participants (54.5%) were male. Where, 45.5% of farmer participants in study group were female, 54.5 % of them were male. In control group, 45.1% of them were female, 54.9% of them were male.

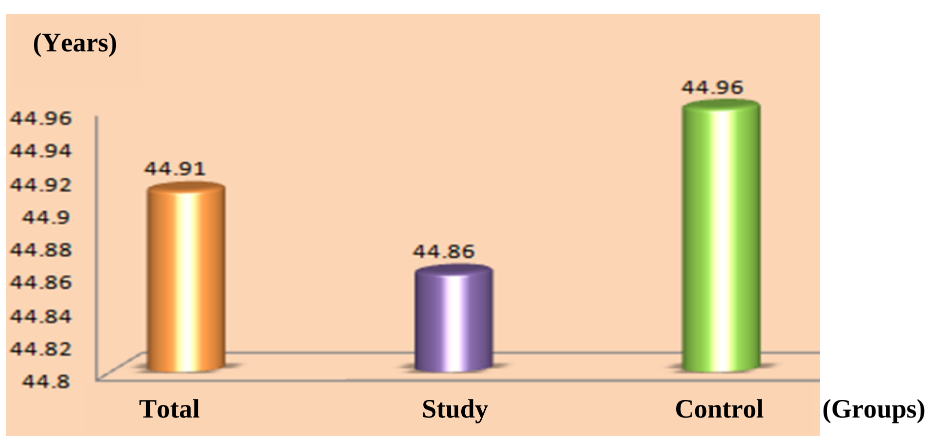

Figure 4.7 Comparison of the average age between study and control groups

The baseline comparison of the average age of the individuals between study and control groups were not significantly different (p = 0.96). The average age of the individuals was 49.91 years old. The average age of them in study group was 44.86 years old, as well as 44.96 years old in control group.

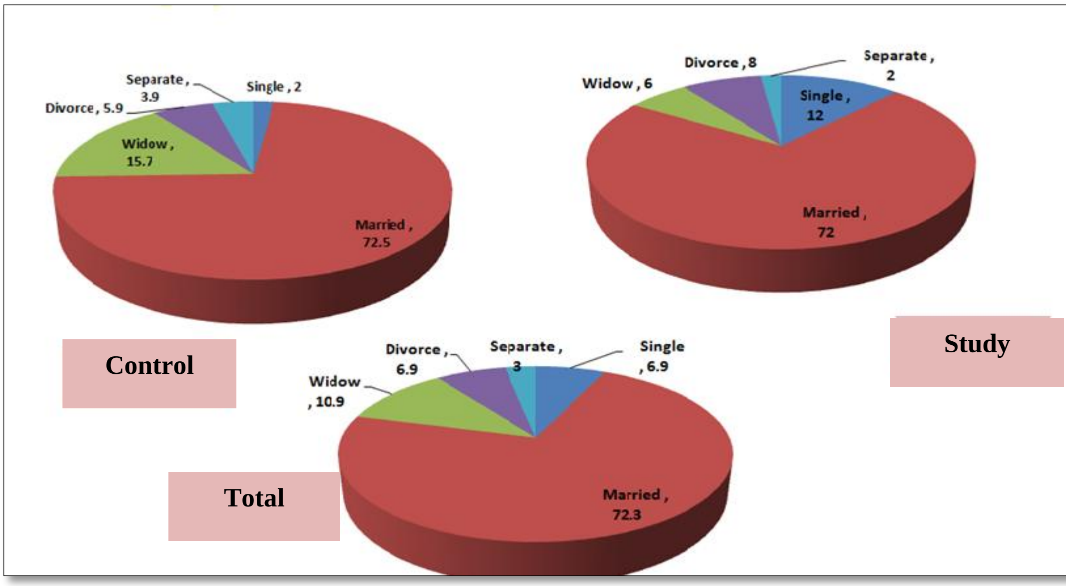

Figure 4.8 Comparison of the marital status between study and control groups

The baseline comparison of the marital status of the individuals between study and control groups were not significantly different (p = 0.176). Most of them (72.30%) were married. In study group, 72.00 % of them were married, 12.00% of them were single, 2.00% of them were separated, 8% of them were divorce, 6 % of them were widow. In control group, 72.5 % of them were married, 2.00% of them were single, 3.90% of them were separated, 5.90% of them were divorce, 15.70% of them were widow.

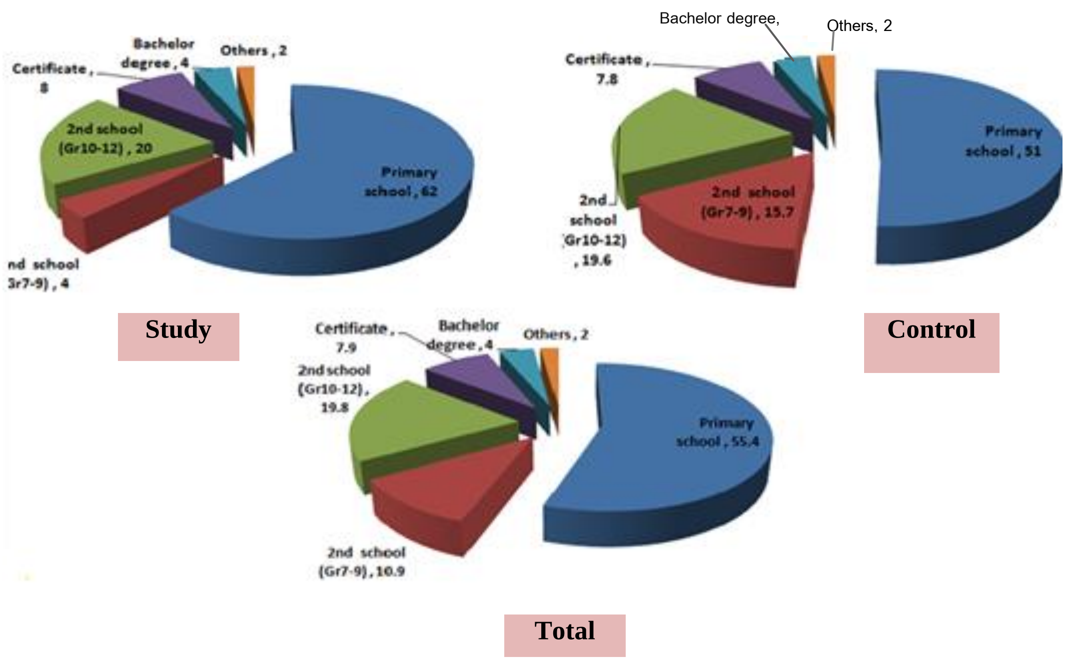

Figure 4.9 Comparison of the highest education between study and control groups

The baseline comparison of the highest education of the individuals between study and control groups were not significantly different (p = 0.545). Most of them were primary school educated (55.4%). In study group, 62.00 % of them were primary school educated, 4.00% of them were secondary school (grade 7-9) educated, 20.00% of them were secondary school educated (grade 10-12), 8% of them were certificate educated, 4 % of them were Bachelor degree educated, and others educated were 2%. In control group, 51.00 % of them were primary school educated, 15.7.00% of them were secondary school (grade 7-9) educated, 19.6.00% of them were secondary school educated (grade 10-12), 7.8% of them were certificate educated, 3.9% of them were Bachelor degree educated, and others also educated were 2%.

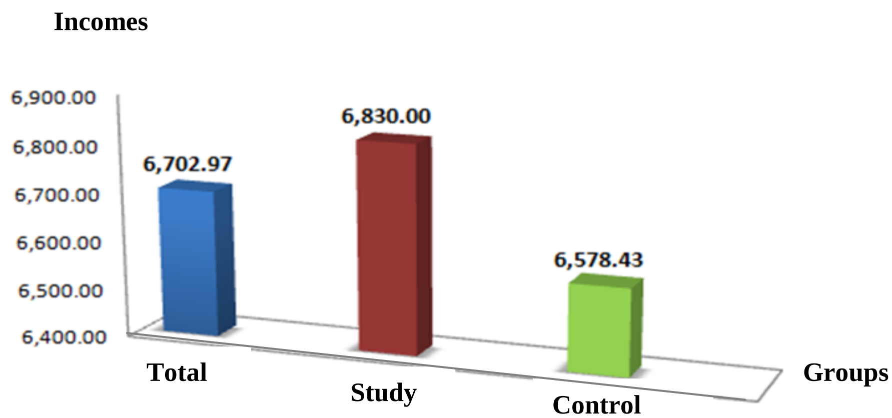

Figure 4.10 Comparison of the monthly income between study and control groups

The baseline comparison of the monthly income of the individuals between study and control groups were not significantly different (p = 0.55). The average income of total farmer participants was 6,702.97 baht per month. Where, the average of the monthly income in study group was 6,830.00 baht, as well as 6,578.43 baht in control group (Figure 4.8).

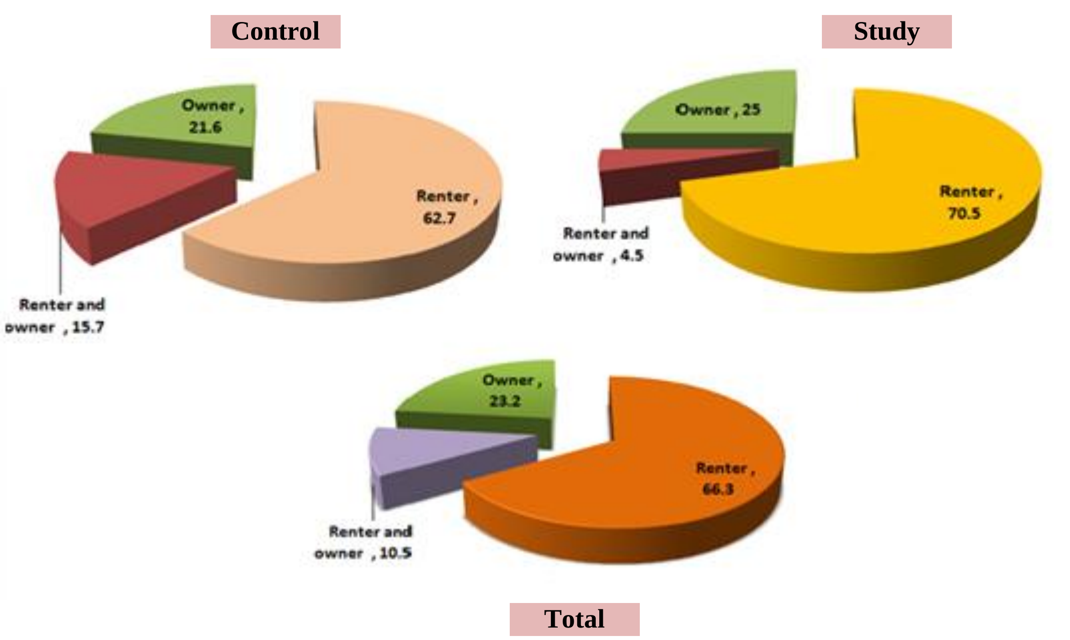

Figure 4.11 Comparison of the type of ownership between study and control groups

The baseline comparison of the type of ownership between study and control groups were not significantly different (p = 0.210). Most of farmer participants (66.30%) rented the farms where they worked. Some of them (23.2%) owned the land for farming, and the others rented and owned the farm for working. In study group, 70.50 % of them rented the farms where they worked, some of them (25.00%) owned the land for farming, and the others (4.50%) rented and owned the farm for working. In control group, 62.70 % of them rented the farms where they worked, some of them (21.60%) owned the land for farming, and the others (15.7%) rented and owned the farm for working (Figure 4.11).

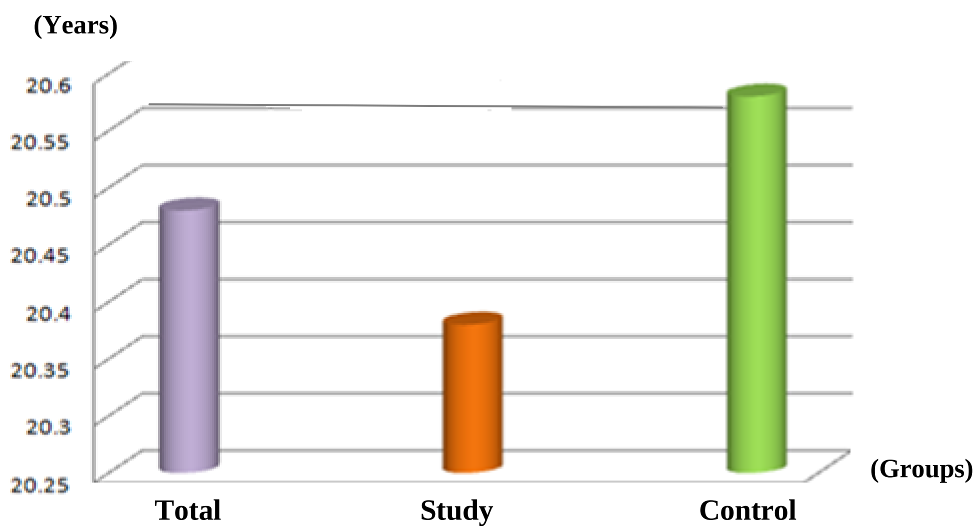

Figure 4.12 Comparison of the duration in agricultural occupation between study and control groups

The baseline comparison of the duration in agricultural occupation between study and control groups were not significantly different (p = 0.94). Most of farmer participants had been involved in agricultural labor for an average of 20.48 years. Most of them in the study group had been involved in agricultural labor for an average of 20.38 years, as well as they had been involved in agricultural labor for 20.58 years in control group.

Findings from focus group discussion and in-depth interviews revealed that major factors of health risk behaviors related to agrochemical exposure in the Khlong Seven community caused by the misuse of pesticides including erroneous beliefs of farmers about pesticide toxicity, lack of attention to safety precautions, environmental hazards, and information about first aid and antidotes given by the label, the use of faulty spraying equipment or lack of proper maintenance of spraying equipments, and protective gears and appropriate clothing during handling of pesticides. Most of the farmers reported using agrochemical products containing the organophosphate pesticide as active ingredient.

Table 4.6 Comparison of means of **independent** variable (knowledge) between **before** implementation the intervention in study and control groups

Variables	**Total score**	**Mean (S.D.)**		**P-value**
		Control (n=51)	**Study (n=50)**	
Knowledge score	22	6.94 (2.32)	7.66 (1.41)	0.063

Note: Independent Samples T test, statistically significant at p -value< 0.05

Comparison of total knowledge scores regarding agrochemical use (independent variable) between *before* intervention in the study and control groups: The baseline pre-test comparison of the mean scores of knowledge between study and control groups showed no significant difference (p = 0.063). Farmer participants in both study and control groups had low level of knowledge score regarding agrochemical use. The level of average knowledge scores regarding agrochemical exposure in study and control group were 6.94 (2.32) and 7.66 (1.41), respectively (Table 4.6).

Table 4.7 Comparison of means of belief scores (independent variables) on agrochemical safety between before implementation the intervention in study and control groups

Variables	Total score	Mean (S.D.) Control (n=51)	Mean (S.D.) Study (n=50)	P-value
Belief scores		18.39	17.86	
1. Perceived susceptibility of agrochemicals	35	(2.15)	(2.30)	0.233
2. Perceived severity to agrochemical hazards		9.10	9.38	
	20	(0.94)	(1.21)	0.194
3. Perceived benefits of agrochemical safety		11.65	12.16	
	25	(1.65)	(1.56)	0.111
4. Perceived barriers of improving		13.51	14.44	
agrochemical safety	25	(3.42)	(3.35)	0.171
		52.65	53.84	
Total belief	105	(4.13)	(5.06)	0.197

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Note: Independent Samples T test, statistically significant at p -value< 0.05

Comparison of belief scores (independent variables) on agrochemical safety between *before* intervention in the study and control groups*:* In study group, farmer participants had negative level of total belief regarding agrochemical use. They had negative beliefs of perceived susceptibility, severity, benefits, and barriers on agrochemical safety. The level of total belief score regarding agrochemical safety was 52.65 (4.13). The beliefs concerning the perceived of perceived susceptibility, severity, benefits, and barriers on agrochemical safety were 6.94 (2.32), 18.39 (2.15), 9.10 (0.94), 11.65 (1.65), 13.51 (3.42), respectively (Table 4.7).

In control group, farmer participants also had negative level of total belief regarding agrochemical use. They had negative beliefs of perceived susceptibility, severity, benefits, and barriers on agrochemical safety. In study group, the level of total belief score regarding agrochemical safety was 53.84 (5.06). The beliefs concerning the perceived of perceived susceptibility, severity, benefits, and barriers on agrochemical safety were 17.86 (2.30), 9.38 (1.21), 12.16 (1.56), 14.44 (3.35), respectively (Table 4.7).

Table 4.8 Comparison of means of behaviors (independent variables) regarding agrochemical safety between before implementation the intervention in study and control groups

Variables	Total score	Mean (S.D.)		P-value
		Control (n=51)	Study (n=50)	
Safety Behavior scores	80	44.84 (3.07)	45.20 (3.04)	0.741

Note: Independent Samples T test, statistically significant at p -value< 0.05

Comparison of mean scores of behaviors (independent variable) regarding agrochemical safety between *before* intervention in the study and control groups*:* The baseline pre-test comparison of the mean scores of behaviors regarding agrochemical safety between study and control groups showed no significant difference (p = 0.741). Farmer participants in both study and control groups had a negative belief on agrochemical safety. The mean score of behaviors regarding agrochemical safety in study group was 45.20 (3.04), as well as the mean score of behaviors regarding agrochemical safety was 44.84 (3.07) in control group (Table 4.8).

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Table 4.9 Comparison of means of home's pesticide safety assessment scores (independent variables) between before implementation the intervention in study and control groups

Variables	Total score	Mean (S.D.)		P-value
		Control (n=51)	Study (n=50)	
Home's pesticide safety assessment score	12	5.51 (2.21)	5.68 (1.73)	0.672

Note: Independent Samples T test, statistically significant at p -value< 0.05

Comparison of mean scores of Home's pesticide safety assessment (independent variables) between *before* intervention in the study and control groups*:* The baseline pre-test comparison of the mean scores of home's pesticide safety assessment between study and control groups showed no significant difference (p = 0.672). Farmer participants in both study and control groups had low level of home's pesticide safety assessment scores. The mean scores of home's pesticide safety assessment in study group was 5.68 (1.73), as well as the mean scores of home's pesticide safety assessment in control group was 5.51 (2.21) (Table 4.9).

Comparison of community participation regarding agrochemical safety (*independent* variables) between *before* intervention in the study and control groups*:* The baseline pre-test comparison of total scores of community participation regarding agrochemical safety between study and control groups showed no significant difference (p >0.05). Farmer participants in both study and control groups had low level of total score of community participation regarding agrochemical safety (Table 4.9).

Table 4.10 Comparison of means of community participation scores (independent variables) between before implementation the intervention in study and control groups

Variables	Total score	Mean (S.D.) Control (n=51)	Mean (S.D.) Study (n=50)	P-value
Community participation scores				
1. Need assessments	15	8.31(1.10)	7.88(1.09)	0.051
2. Leadership	10	6.02(1.029)	5.72(0.90)	0.124
3. Resource mobilization	5	2.43(0.83)	2.71(0.87)	0.048
4. Organizational factor	10	5.12(1.31)	5.48(1.14)	0.147
5. Management	5	2.53(0.67)	2.32(0.51)	0.082
Total community participation	45	24.41(2.32)	24.14(2.02)	0.563

Note: Independent Samples T test, statistically significant at p -value< 0.05

The level of total score of community participation regarding agrochemical safety in both study and control groups were 24.14(2.02) and 24.41(2.32), respectively. The scores of community participation regarding agrochemical safety concerning needs assessment, leadership, organization, resource mobilization, and management in study group were 7.88(1.09), 5.72(0.90), 2.71(0.87), 5.48(1.14), 2.32(0.51), respectively, as well as the scores of community participation regarding agrochemical safety concerning needs assessment, leadership, organization, resource mobilization, and management were in control were 8.31(1.10), 6.02(1.029), 2.43(0.83), 5.12(1.31), and 2.53(0.67) respectively (Table 4.10).

Table 4.11 Comparison of means of knowledge (**independent** variables) between **after** implementation the intervention in control and study groups

Variables	**Total score**	**Mean (S.D.)**		**P-value**
		Control (n=51)	**Study (n=50)**	
Knowledge score	22	7.18 (2.79)	17.80 (2.49)	<0.001

Note: Independent Samples T test, statistically significant at p -value< 0.05

Comparison of knowledge scores regarding agrochemical safety (*independent* variables) between *after* intervention in the study and control groups*:* After six months of the community-based intervention, there were significant differences on scores of knowledge in the study group and control groups (p <0.001). Farmer participants in study group had high level of knowledge score regarding agrochemical use. The level of average knowledge scores regarding agrochemical exposure was 17.80 (2.49). In the other hand, farmer participants in control group had low level of knowledge regarding agrochemical use. The level of average knowledge regarding agrochemical exposure in control group was 17.80 (2.49) (Table 4.11).

Table 4.12 Comparison of means of belief scores (independent variables) between after implementation the intervention in control and study groups

Variables	Total score	Mean (S.D.) Control (n=51)	Mean (S.D.) Study (n=50)	P-value
Belief scores				
1. Perceived susceptibility of agrochemicals	35	17.94 (2.75)	27.40 (2.01)	<0.001
2. Perceived severity to agrochemical hazards	20	9.33 (1.49)	14.76 (1.18)	<0.001
3. Perceived benefits of agrochemical safety	25	11.18 (1.93)	17.36 (1.19)	<0.001
4. Perceived barriers of improving agrochemical safety	25	14.29 (3.30)	17.74 (1.76)	<0.001
Total belief	105	52.74 (5.17)	77.26 (2.12)	<0.001

Note: Independent Samples T test, statistically significant at p -value< 0.05

Comparison of belief scores (*independent* variables) regarding agrochemical safety between *after* intervention in the study and control groups*:* After six months of the community-based intervention, there were significant differences on scores of beliefs regarding agrochemical safety in the study group and control groups (p <0.001). In study group, farmer participants had neutral level of total beliefs regarding agrochemical safety. The level of total beliefs regarding agrochemical safety in study group was 77.26 (2.12). The beliefs concerning the perceived of perceived susceptibility, severity, benefits, and barriers on agrochemical safety were 17.94 (2.75), 9.33 (1.49), 11.18 (1.93), 14.29 (3.30), respectively. In control group, farmer participants had low level of beliefs regarding agrochemical safety. The level of total beliefs regarding agrochemical safety in control group was 52.74 (5.17). The beliefs concerning the perceived of perceived susceptibility, severity, benefits, and barriers on agrochemical safety were 17.94 (2.75), 9.33(1.49), 11.18, (1.93) 14.29, respectively (Table 4.12).

Table 4.13 Comparison of means of behaviors (**independent** variables) between **after** implementation the intervention in control and study groups

Variables	Total score	Mean (S.D.)		P-value
		Control (n=51)	Study (n=50)	
Safety Behavior score	80	46.04 (4.04)	54.84 (4.28)	<0.001

Note: Independent Samples T test, statistically significant at p -value< 0.05

Comparison of mean scores of behaviors on agrochemical safety (*independent* variables) between *after* intervention in the study and control groups*:* After six months of the community-based intervention, there were significant differences on total scores of behaviors on agrochemical safety in the study group and control groups (p <0.001). Farmer participants in study group had moderate level of behaviors on agrochemical safety. They had low level of behaviors on agrochemical safety in control group. The mean score of behaviors regarding agrochemical safety in study group was 54.84 (4.28), as well as the mean score of behaviors regarding agrochemical safety was 46.04 (4.04) in control group (Table 4.13).

Table 4.14 Comparison of means of home's pesticide safety assessment scores (independent variables) between after implementation the intervention in control and study groups

Variables	**Total score**	**Mean (S.D.)**		**P-value**
		Control	**Study**	
Home's pesticide safety assessment score	12	4.86 (1.78)	10.24 (1.85)	<0.001

Note: Independent Samples T test, statistically significant at p -value< 0.05

Comparison of mean scores of home's pesticide safety assessment (*independent* variables) between *after* intervention in the study and control groups*:* After six months of the community-based intervention, there were significant differences on total scores of home's pesticide safety assessment in the study group and control groups (p <0.001). Farmer participants in study group had high level of home's pesticide safety assessment scores. They had low level of home's pesticide safety assessment's score in control group. The mean scores of home's pesticide safety assessment in study group was 10.24(1.85), as well as the scores of home's pesticide safety assessment was 4.86(1.78) in control group.

Comparison of mean scores of community participation regarding agrochemical safety (*independent* variables) between *after* intervention in the study and control groups*:* After six months of the community-based intervention, there were significant differences on total scores of **community participation regarding agrochemical safety** in the study group and control groups (p <0.001). With the exception of a community participation's score specifically, community management's score, they exhibited no significant improvement (p = 0.360) (Table 4.14).

Table 4.15 Comparison of mean scores of community participation (independent variables) regarding agrochemical safety between after implementation the intervention in control and study groups (con't)

Variables	Total score	Mean (S.D.)		P-value
		Control (n=51)	Study (n=50)	
Community participation scores				
1. Need assessments	15	8.61(1.23)	10.52(1.15)	<0.001
2. Leadership	10	6.47(1.25)	7.26(1.05)	<0.001
3. Resource mobilization	5	2.71(0.88)	3.14(0.5)	<0.019
4. Organizational factor	10	4.84(1.01)	5.92(1.14)	<0.001
5. Management	5	2.43(0.54)	2.54(0.64)	0.360
Total score of community participation	45	25.0(1.93)	28.70(1.97)	<0.001

Note: Independent Samples T test, statistically significant at p -value< 0.05

Farmer participants in study group had moderate level of community participation regarding agrochemical safety. They had low level of community participation regarding agrochemical safety in control group. The mean score of community participation regarding agrochemical safety in study group was 28.70(1.97). The level of total score of community participation regarding agrochemical safety in both study and control groups were 28.70(1.97) and 25.0(1.93), respectively. The scores of community participation regarding agrochemical safety concerning needs assessment, leadership, organization, resource mobilization, and management in study group were 8.61(1.23), 6.47(1.25), 2.71(0.88), 4.84(1.01), 2.43(0.54), respectively, as well as the scores of community participation regarding agrochemical safety concerning needs assessment, leadership, organization, resource mobilization, and management were in control were 10.52(1.15), 7.26(1.05), 3.14(0.5), 5.92(1.14), 2.54(0.64), respectively (Table 4.15).

Table 4.16 Comparison of Means of the overall *dependent* variables between before and after implementing in the *control group*

Variables	Total score	Mean (S.D.)		P-value
		Before	After	
1. Belief scores		18.39(2.15)	17.94(2.75)	0.180
1.1 Perceived susceptibility of agrochemicals	35			
1.2 Perceived severity to agrochemical hazards	20	9.10(0.94)	9.33(1.49)	0.286
1.3 Perceived benefits of agrochemical safety	25	11.65(1.65)	11.18(1.93)	0.141
1.4 Perceived barriers of improving agrochemical safety	25	13.51(3.42)	14.29(3.30)	0.132
1.5 Total belief	105	52.65(4.13)	52.74(5.17)	0.870
2. Safety Behavior scores	80	44.84(3.07)	46.04(4.04)	0.119
3. Home's pesticide safety assessment score	12	5.51(2.26)	4.86(1.78)	0.139
4. Knowledge score	22	6.94(2.32)	7.18(2.79)	0.122
5. Community participation scores	15	8.31(1.10)	8.61(1.23)	0.193
5.1 Need assessments				
5.2 Leadership	10	6.02(1.03)	6.47(1.25)	0.073
5.3 Resource mobilization	5	2.43(0.83)	2.71(0.88)	0.090
5.4 Organizational factor	10	5.12(1.31)	4.84(1.01)	0.208
5.5 Management	5	2.53(0.67)	2.43(0.54)	0.462
5.6 Total score of community participation	45	24.42(2.32)	25.06(1.93)	0.104

Note: Paired- Samples T test, statistically significant at p –value <0.05

Comparison of Means of the overall *dependent* variables between before implementation the intervention in *control group:* Surprisingly, the mean score of overall scores in control group between pre-test and post-test showed no significant improvements. After six months of the community-based intervention, there were no significant differences on overall scores of knowledge, belief, behavior, home's pesticide safety assessment, community participation in the control group ($p > 0.05$) (Table 4.16).

Table 4.17 Comparison of Means of the overall *dependent* variables between before and after implementation in the *study group*

Variables	Total score	Mean (S.D.)		P-value
		Before	After	
1. Belief scores				
1.1 Perceived susceptibility of agrochemicals	35	17.86(2.30)	27.40(2.01)	<0.001
1.2 Perceived severity to agrochemical hazards	20	9.38(1.21)	14.76(1.18)	<0.001
1.3 Perceived benefits of agrochemical safety	25	12.16(1.56)	17.36(1.19)	<0.001
1.4 Perceived barriers of improving agrochemical safety	25	14.44(3.35)	17.74(1.76)	<0.001
1.6 Total belief	105	53.84(5.06)	77.26(2.12)	<0.001
2. Safety Behavior scores	80	45.20(3.04)	54.84(4.28)	<0.001
3. Home's pesticide safety assessment score	12	5.68(1.73)	10.24(1.85)	<0.001
4. Knowledge score	22	7.66(1.41)	17.80(2.49)	<0.001
5. Community participation scores				
5.1 Needs assessment	15	7.88(1.10)	9.8(1.15)	<0.001
5.2 Leadership	10	5.72(0.90)	7.26(1.05)	<0.001
5.3 Resource mobilization	5	2.76(0.89)	3.14(0.95)	0.071
5.4 Organizational factor	10	5.48(1.18)	5.92(1.14)	0.057
5.5 Management	5	2.32(0.51)	2.54(0.65)	0.086
5.6 Total community participation	45	24.16(2.02)	28.70(1.97)	<0.001

Note: Paired- Samples T test, statistically significant at p –value <0.05

Comparison of Means of the overall *dependent* variables between before and after implementation in the *study group:* After six months of the community-based intervention, the mean scores of overall scores in study group between pre-test and post-test were significantly improvements (p<0.05). The farmer participants in the study group had significantly higher scores of knowledge, beliefs and behaviors on agrochemical utilization, home's pesticide safety assessment and community participation after receiving the intervention. With the exception of community participation's score specifically, resource mobilization, organizational factor, and management's scores (p = 0.071, 0.057 and 0.086 respectively) (Table 4.17).

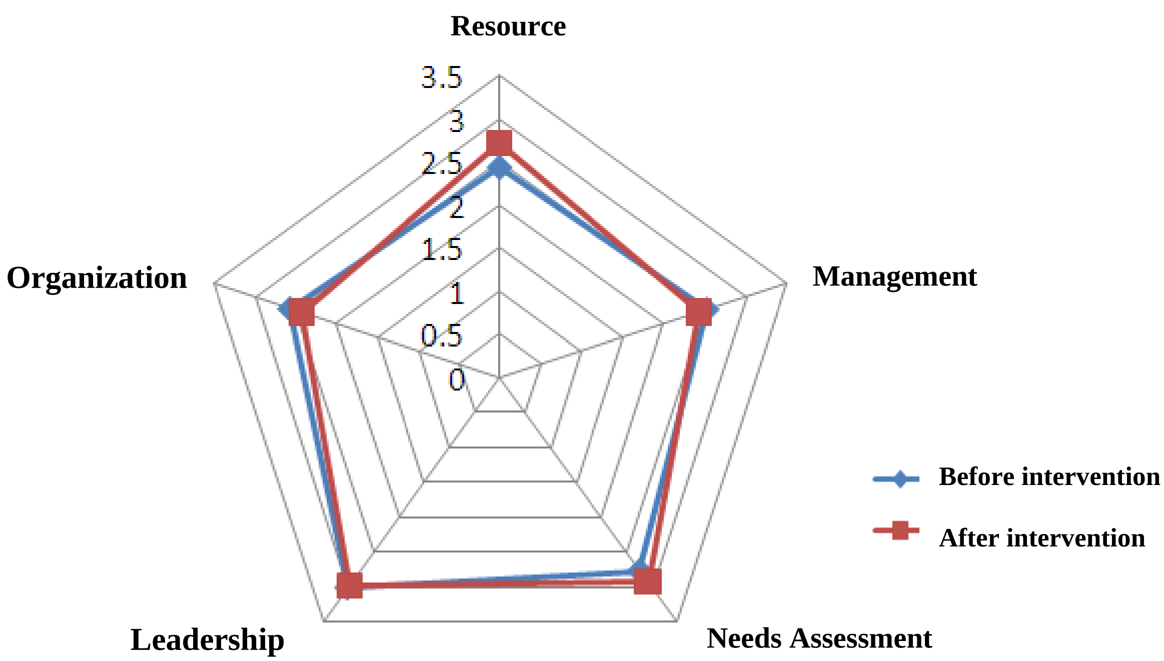

Figure 4.13 Spider-gram of community participation in control group

The average scores of community participation regarding agrochemical safety in control group involved 5 factors including: needs assessment, leadership, organization, resource mobilization, and management. The mean scores of overall scores in control group between pre-test (before intervention) and post-test (after intervention) were not significantly improvements (p>0.05). The spider-gram showed the ranges between pre-test's score and post-test's score were quite narrow (Figure 4.13).

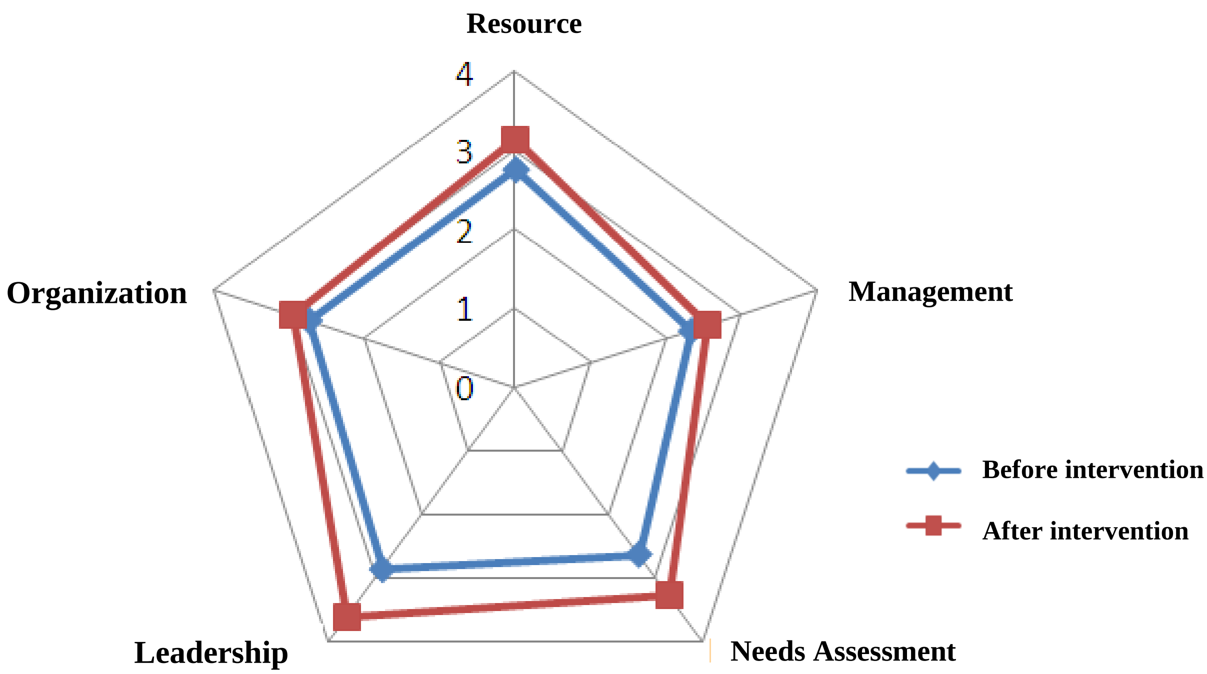

Figure 4.14 Spider-gram of community participation in study group

The average scores of community participation regarding agrochemical safety in study group involved 5 factors including: needs assessment, leadership, organization, resource mobilization, and management. The mean scores of overall score of community participation regarding agrochemical safety between pre-test (before intervention) and post-test (after intervention) were significantly improvements (p>0.05). The farmer participants in the study group had significantly higher scores of community participation after receiving the intervention. With the exception of community participation's score specifically, resource mobilization, organizational factor, and management (Figure 4.14)

The spider-gram showed the ranges between pre-test's score and post-test's score were quite narrow in dimensions of resource mobilization, organizational factor, and management. In other hand, the spider-gram showed the ranges between pre-test's score and post-test's score were wide in dimensions of needs assessment and leadership (Figure 4.14).

Table 4.18 Comparison of means of overall variables between before and after implementation the intervention in study and control groups

Variables	Total score	Before			After			P-value[b] of the dependent variables, before and after intervention (95%CI of the difference)	
		Mean (S.D.)		P-value[a] of the independent variables (95%CI of the difference)	Mean (S.D.)		P-value[a] of the independent variables (95%CI of the difference)		
		Control	Study		Control	Study		Control	Study
1. Belief score	105	52.65 (4.13)	53.84 (5.06)	0.197 (-3.01,0.63)	52.74 (4.50)	77.26 (2.12)	<0.001 (-25.91,-23.2)	0.870 (-1.29,1.10)	<0.001 (-25.02,21.82)
2. Safety Behavior score	80	44.84 (3.07)	45.20 (3.04)	0.741 (-2.49, 1.78)	46.04 (4.04)	54.84 (4.28)	<001 (-11.62,-5.98)	0.119 (-2.71, 0.32)	<0.001 (-11.15, -8.13)
3. Home's pesticide safety assessment score	12	5.51 (2.26)	5.68 (1.73)	0.672 (-0.96, 0.63)	4.86 (1.78)	10.24 (1.85)	<0.001 (-0.6.09,-4.66)	0.139 (-1.51,0.21)	<0.001 (3.91,5.2)
4. Knowledge score	22	6.94 (2.32)	7.66 (1.41)	0.063 (-1.47,0.40)	7.18 (2.79)	17.80 (2.49)	<0.001 (-11.67,-9.58)	0.122 (-0.53,0.065)	<0.001 (-10.93,-9.34)
5. Community participation score	45	24.41 (2.32)	24.16 (2.02)	0.563 (-0.61,1.11)	25.06 (1.93)	28.70 (1.97)	<0.001 (-4.41,-2.87)	0.104 (-1.43,0.14)	<0.001 (-5.36,-3.72)

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Note: [a]Independent Samples T test, [b]Dependent Samples paired T test, statistically significant at p –value<0.05

The baseline pre-test comparison of overall mean scores of knowledge, beliefs, behaviors, home's pesticide safety assessment, and community participation between study and control groups showed no significant difference of all scores (p >0.05) . After six months of the community-based intervention, there were significant differences on overall scores of knowledge, belief, behavior, home's pesticide safety-assessment, and spider-gram of community participation in the study group and control groups ($p < 0.05$). With the exception of a community participation's score specifically, community management's score, they exhibited no significant improvement ($p=0.360$) (Table 4.18).

After six months of the intervention program, there were significant improvements in the overall scores on knowledge, belief, behavior, home's pesticide safety assessment, and community participation regarding agrochemical safety in the study group ($p<0.05$). There were no significant improvements in all total scores for the control group ($p>0.05$) (Table 4.18).

CHAPTER V

DISCUSSION, CONCLUSION & RECOMMENDATIONS

A cross-sectinal research design was applied to evaluate mean scores of farmer's beliefs and behaviors in phase I. A quasi-experimental research design to examine the changes in the mean scores on the variables: knowledge, beliefs, behaviors, home's pesticide safety assessment, and community participation regarding agrochemical safety in phase II. Knowledge on agrochemical use involved having an understanding and basic knowledge of agrochemicals and agrochemical safety behaviors. The study objectives were to evaluate knowledge, beliefs, behaviors, conduct a home pesticide safety assessment, and their community participation regarding agrochemical safety among the famers; to develop a model for improving farmer's health and protecting them from agrochemical hazards; and to evaluate the effectiveness of the intervention regarding agrochemical safety among farmers over the period October 2009 to January 2011. Health beliefs on agrochemical use included perceived susceptibility, severity, benefits, and barriers to using agrochemicals. Agrochemical safety behaviors involved specific self-care practices in personal health and those concerning self-care practices, including before spraying, during spraying, storage, transportation, waste management, and health risk management. The data collection was divided into two phases. Firstly, a cross-sectional study comprising 482 rice farmers were randomly recruited. Secondly, a quasi-experimental study of fifty rice farmers from Khlong Seven community, thestudy group, and fifty one rice farmers from Bueng Ka Sam community, the control group, were recruited with the support from community leaders. An intervention was a combination of home visits focusing on pesticide safety assessments at home and community participatory activities regarding agrochemical safety. Health risk behaviors regarding agrochemical exposure in the study area mainly caused from lack of attention to safety precautions, the wearing of faulty protective gear. After six months of the intervention program, there were significant improvements in overall scores on knowledge, beliefs, behaviors, the home’s pesticide safety assessment, and community participation regarding agrochemical safey in the study group ($p < 0.05$). Therefore, this intervention model appeared to be effective in improving agrochemical safety behaviors among the Khlong Seven Community rice farmer participants. These findings show that multi-approach model for improving agrochemical safety behaviors could create a sustainable model to prevent the farmers from agrochemical hazards.

5.1 Discussion

Phase I Cross sectional study

The objectives of this study were to evaluate health beliefs and behaviors associated with agrochemical safety among rice farmers. The Health Belief Model, community-based ethnography and public health risk assessment were applied in this study. Data were collected from 482 rice farmers in Khlong Seven community from January to June 2010. Data comprised observations, unstructured and semi-structured interviews and focus group discussions. The findings revealed that farmers had neutral levels of total belief regarding agrochemical safety. They had neutral levels of perceived susceptibility, benefits, and barriers on agrochemical safety. Where their belief on perceived of severity of agrochemicals was high (positive belief). They had moderate levels of total behavior regarding agrochemical safety. They had moderate levels of the healthy personal care behavior. Those with neutral levels of using personal protective equipment were especially low. Health risk behaviors regarding agrochemical exposure in the study area were mainly caused by the misuse of pesticides including erroneous beliefs of farmers on pesticide toxicity, the use of faulty spraying equipment or lack of proper maintenance of spraying equipment, protective gear and appropriate clothing. An intervention program is necessary to improve safer agrochemical behaviors in the rice Khlong Seven community. Similarly to the study of Arcury et al. (2001), they found that Health beliefs among some Mexican farmworkers in North Carolina may have incurred some difficulties in making use of the most basic safety and sanitation facilities that were available to them. Farmers did not understand pesticide risks faced by farm-workers who were not applicators.

The most popular brand name of pesticide in the Khlong Seven community was “Abamectin”. Abamectin is dominant insecticide that rice farmers use in Thaiand. It has high toxicity to some insects such as bees and hymenopteran parasitoids. Farmers in the Khlong Seven community seem motivated to apply them because of lack of knowledge and advertising campaigns using emotional appeals. Although, the “Stop use of cypermethrin and abamectin” campaign in Thailand was launched in last year, they have been used by Thai farmers including the Khlong Seven farmers. However, it’s very hard to regulate and control agrochemical use among the famers in the Khlong Seven community, positive motivation activities regarding agrochemical safety behaviors can be done in their community setting. For example, agrochemical safety behavior campaigns "get 1 egg for 1 used pesticide container".

The strength of this Health Belief Model framework was specification of distinctresearch phases to identify a health problem and those behaviors that impacted on improving agrochemical safety, to identify modifiable behaviors and environmental factors, and to specify factors that predisposed farmers to change their behaviors, reinforce behavior change and enable positive behaviors related improving agrochemical safety. The significance of these findings had two aspects. Firstly, the finding implied that the primary influence that impeded farmers' using personal protective equipment was financial. Additionally, farmers did not wear personal protective equipment because it interfered with their work. For example, although gloves, boots, protective lenses, and hats are available at local stores, economic barriers may preclude the farmers from purchasing them. Farmers with little formal education might be at higher risk when using pesticides due to difficulties in understanding the instructions and safety procedures included on the product labels. In addition, using the questionnaires to measure the risk behaviors regarding to using agrochemicals might not accurately reflect the actual behaviors of the farmer participants. These findings are similar to Shedra et al (2009). They used community-based ethnography and public health risk assessment to assess beliefs about pesticide exposure risks among farm workers in the Lower Yakima Valley of Washington State. They found farm worker's pesticide-relevant beliefs regarding perceived danger and susceptibility to pesticides, the need to put safety second to financial considerations, and reasons for delaying decontamination. These findings are also similar to results reported in some other studies (for example, Wongwichit, 2012; Norkaew, 2010), although, farmers were aware of pesticide hazards and they knew the benefits of some actions to protect themselves from pesticides, they rarely used personal protective equipments. Farmers generally were not aware of potential hazards pesticides might cause them and their families. The findings in this phase was done in the setting of rice farmers in Khlong Seven community, the extent to which these findings can be generalized to the others areas in Thailand or other countries cannot be determined without further research. The finding of risk behaviors associated with agrochemical exposure can be applicable to other settings. However, variation in beliefs and behaviors may exist across regions due to variations in locality, origin of belief systems, linguistic variations, cultural diversity, differences in education, and the extent of the safety culture of a particular community. In short, farm owners and farmers applying the agrochemicals may be influenced by the different cultural beliefs held by farmers compared with other study regions. Although the farmers were employed in Pathumtani Province, they carried contradictory opinions on whether or not they were exposed to agrochemicals and on the dangers. On the contrary, farmers were relatively uniform in their beliefs and cultural similarity, having learned about agrochemicals in Government mandated and administered courses, as well as through experience and discussions with other farmers in the region.

Understanding these health risk behaviors regarding agrochemical exposure can help establish relationships between health problems from agrochemical exposure and other health conditions. These lead to the setting of priorities which guided the focus of the persent intervention program and the development and resource utilization that made possible the delineation of responsibilities between different professionals, organizations and agricultural agencies. These findings are consistent with Pinyupa et al. (2009). They found that pesticide use patterns among small-scale farmers in Thailand need more improvement. Educational interventions are important for promoting safety during all phases of pesticide handling. Public policies should be developed to encourage farmers to change their pest management methods from agrochemicals.

Clearly, there is need for strategies to stress the health impacts and environmental issues from agrochemical use in Khlong Seven community. Additionally, the basic safety precautions still have to be affordable for farmers to assist them deal with agrochemical use more safely. Greater enforcement of regulations regarding field are needed as well as to enhance the level of substantive dialogue with Government policy makers.

According to the principle of Health Belief Model (Becker et al., 1978) the results show that farmer participants scored neutrally on total health beliefs on agrochemical exposure. They had neutral levels of perceived susceptibility to agrochemical hazards, perceived seriousness or severity of agrochemical hazards, perceived the protective barriers of improving agrochemical safety, and perceived benefits on agrochemical safety. In order to achieve positive beliefs regarding agrochemical exposure, these findings suggest that the rice farmer participants need more motivations and education related perception of agrochemicals; especially pesticide risks and hazards. The examples of concerned health beliefs on agrochemical use were: long term exposure to agrochemicals, especially pesticides that can affect the nervous system. Similarly the erroneous belief, that pesticide containers can be washed and reused for cooking food. Farmers also need to be are that allergic reactions to agrochemicals can more easily develop potentially dangerous complications to other diseases more easily. It is important to stess that for health safety, the farmer should always read agrochemical instructions carefully before use to reduce the risk of agrochemical exposure, especially from pesticide exposure. Farmers should also be instructed to spray the same direction with the wind while wearing complete personal protective equipments such as hat, gloves, boots, mask, etc. to protect them from danger.

The finding in this phase demonstrates that health risk behaviors associated with agrochemical exposure among rice farmers in this rural community is an environmental health concern. Although the Khlong Seven rice farmers recognize the hazards of agrochemicals, especially pesticides, to human health and the environment, transforming this knowledge into practical actions that result in lower levels of exposure might prove a difficult task. Educational and technical support that takes into account cultural and socioeconomic aspects of the farmers are needed to change the scenarios observed in this study. These findings from this phase call for comprehensive community interventions that involve and engage multiple stakeholders aimed at increasing the adoption of agrochemical safety behaviors and reducing agrochemical exposure in rice farmers. Although the farmers in Khlong Seven community recognize the potential harm of pesticides to human health and the environment, transforming this knowledge into practical actions that result in lower levels of exposure might prove a complex and multidimensional task. In addition, Governmental actions, such as interdiction or restrictions on the use of pesticides and enforcement of good agricultural practices, including the use of safety equipment, are needed to decrease the pesticide exposure of the farmers. A comprehensive pesticide safety model needs to be developed by persons with different areas of expertise. In the Khlong Seven District these experts would include persons with expertise in farm labour conditions and the work environment, researchers and educators, and experts in safety and health. They should strive for an open and informal atmosphere so that all participants feel comfortable expressing their ideas and opinions. A process model was developed that included the structure for initiating and maintaining these programs. An active learning process involved the farmer participants in a "learning by doing" teaching strategy. The actual doing includes such activities as modelling behaviours, acting out work scenarios, and participating in the discussion and presentation of the information.

Phase II Quasi-experimental study

The objectives of this phase were to develop a model for improving farmer's health from agrochemical hazards; and to evaluate effectiveness of the model of interventions associated with improving agrochemical safety among farmers. Preventing agrochemical exposures and improving agrochemical safety behaviors are important public health concerns. Community involvement was viewed as an important process to solve environmental health problems. Despite this, they appeared to be more concerned with their financial situation.

The results found a significant improvement in the study group when we compared before and after the programs. All had significantly increased results and were able to demonstrate the effectiveness of the intervention in the study group. These findings are consistent with Janhong's (2005) study. They found that their experimental group had significantly higher mean scores on knowledge, attitudes, and practices than than before implementing the intervention ($p<0.001$). The overall mean scores between pre-test and post-test in the control group showed no significant changes. These findings are also similar to Susan et al. (2007). They found that the US/Mexico border region farmers who got education programs based on Health Belief Model including pesticide safety, have statistically significant changes occurred with both knowledge and behavior in regards to safe pesticide use. In addition, these findings are also consistent with Sara et al. (2001). They applied participatory research within the planning framework including Health Belief Model for training Mexican farmworkers in North Carolina cucumber and tobacco production. They found clearly, farmworker education alone was not the only change needed to protect farmworkers from pesticide exposure. Increasing enforcement of regulations regarding field sanitation and housing are needed to improve their health.

The increase of some scores in contral group, for example, safety behavior scores after handling agrochemicals (one respondent reported “take a bath immediately after crop-dusting agrochemicals”), this might be affected from competing external influences, such as the mass media. Equally important, the farmers walked around the farms working on the crops and some family farmers who were relatives, so it was difficult to be sure that the farmers in the control community did not receive some aspects of the intervention from other sources. However, the safety behavior scores in a part of "before handling agrochemicals" showed no significant improvements, this implies that the rice farmer participants needed more motivations and education specifically the practices or behaviors related to handing agrochemicals such as reading an instruction before use, providing a full set of personal protective equipment.

Although the study was carefully designed in what was considered the most appropriate method using a quasi-experimental method with a control group and using pre-test and post-test, interpreting the results have to be treated cautiously because they might be affected by external factors such as the previous experience of participants and recall bias from the pre-test. Moreover, using the questionnaires to measure the behaviors of using agrochemicals might not reflect actual behaviors. Qualitative approaches, such as observation, in-depth interviews, focus group discussions, can be used to probe for additional detail beyond the basic details in the questionnaire. It should be noted however, that statistical significance does not necessarily guarantee a measurable impact on agrochemical safety behaviors, the control group needs to be compared with study group in this study. In terms of for further study, researchers use biomarker assessments to objectively test the degree rice farmers are adhering to measure to reduce exposure to agrochemicals.

New material products regarding agrochemical safety behaviors developed by Khlong Seven rice farmer's ideas including: Khlong Seven agrochemical safety videos, agrochemical safety booklets, agrochemical safety education flip charts, online web link materials, and agrochemical safety posters, are very useful for the farmers in the Khlong

Seven community and other communities. Famer participants had really appreciated agrochemical safety booklets because the used language was easy to understand. They could get the points easily by pictures in the book. Some of farmer participants said this book was very useful practice guideline for them. They had also appreciated the story in the case study of agrochemical safety video because of the lesson and learn more about the hazards from agrochemical risk behaviors in this vedio. In addition, actors in the scenario of video were the khlong Seven community participants, they felt they were important role play in the community to improving agrochemical safety. However, a local online web link materials regarding agrochemical safety has been provided in the part of environmental health promotion in the Khlong Seven sub-district administrative organization web site, everyone not only the Seven community farmer participants but also other people or other organization can access easily this web link. The director of Khlong Seven sub-district administrative organization and the health care workers said this web link was very useful information source and useful guideline for improving agrochemical safety behavior among farmers in their community and for the other communities and other organizations.

Community participation assessment is a complex and challenging approach to improving the agrochemical safety among the farmers in the Khlong Seven community. Viewing participation as an intervention to achieve the goal of the study, has produced disappointing results and suggests that viewing participation as a product, raises expectations that experience shows cannot be met. Regarding spider-gram of community participation assessments, the factors which influence the community participation were needs assessment, leadership, organization, resource mobilization and management. These indicators are intended to show the changes and the processes of participation in intervention regarding agrochemical safety. After the six months of intervention program, the results revealed that there was significant improvement in total score on community participation regarding agrochemical safety. There were no significant improvements in scores on resource mobilization, organization, and management for the study group (p = 0.71, 0.057, 0.086, respectively). Furthermore, the results revealed that scores of organization, and management before after intervention were quite low. These refered that the Khlong Seven community farmer participants had been faced management and organizational problems related to agrochemical safety. These findings implied that the Khlong Seven community needed more specific strategies for improving community participation regarding agrochemical safety in the dimensions of resource mobilization, organization, and management. Resource mobilization improvement need to involve a team effort, the Khlong Seven community's commitment to resource mobilization; acceptance for the need to raise resources in the Khlong Seven community; and institutionalizing resource mobilization priorities, policies and budget allocation regarding agrochemical safety project study. Organizational management and development involves establishing and strengthening organizations for the resource mobilization process in Khlong Seven community. It involves identifying the Khlong Seven community's vision, mission, and goals, and putting in place internal systems and processes that enable the resource mobilization efforts, such as: identifying the roles of community leaders and health care workers efficiently and effectively managing material, man and financial resources; creating and implementing a strategic plan that addresses the proper stewardship and use of existing funds on the one hand, and identifies and seeks out diversified sources of future funding on other community.

The study in this phase was only conducted in Pathumthani province. Therefore, the results might not be representative compared with other rural populations with different agrochemical practices. To sustain the intervention, Researchers have to work collaboratively with the Khlong Seven community partners and local authorities. We can develop manual and other educational materials and encourage other communities to replicate the project. Researchers have to also work with local authorities, advocacy groups and community farmers to incorporate the results of the intervention into appropriate policy changes. By placing more ownership of an agrochemical safety in the community, the Khlong Seven community members have the capacity and the commitment to operate and manage the improved agrochemical safety project. When they become closely involved with implementation of the study project, they became members of the project staff and shared in the responsibility for the results and ultimately the effectiveness of the overall project.

5.2 Recommendations

The intervention program led to sustainable agrochemical safety programs at the Kholng Seven community. Improved participation also produces more sustainable products, and a comprehensive agrochemical home safety model that it is hoped will continue to be used by Khlong Seven community members. Many projects have a significant impact during the time that they are implemented, but are not carried on when the initial project staff leave. If Khlong Seven community members are not involved, there will not be anyone familiar enough with the project to carry it forward. By giving more ownership of an agrochemical-related project in the community, the Khlong Seven members themselves will have the capacity and the commitment to operate and manage the project.

Community-based participation must be a true partnership between the health care professionals and the community that is intended to benefit from the activity. For this to happen, communication and trust have be established early in the process and carefully nurtured throughout the project. It is important to keep the Khlong Seven community informed about project activities, so the settings for interaction with the community should promote discussion and lead to a further critique of new and existing practices. Project staffs should not simply present information to the process, but be carefully nurtured throughout the project. It is important to keep the Khlong Seven community informed about ongoing activities. Furthermore, opinions should be solicited, reactions to the research compiled and discussed, and key points need to be explored and clarified. It is important to keep the Khlong Seven community because it provides important insights can be gained and further participation should be encouraged.

In order to feel responsible for their commnity the rice farmers have to be recognized for their knowledge, skills and experience and encouraged to contribute to the project. Similarly, project staffs members have invest their time to share their knowledge of the research and education process with community members, as these same project staff members ask community members to share their knowledge of the community, their experiences, and their beliefs. Khlong Seven community members have to assist the project staff with planning the initial project and be prepared to modify it along the way. With Khlong community input in planning, the inevitable adjustments that are needed during a project will be ongoing, making it ultimately more effective. Meetings have to be held with various Khlong Seven community representatives and stakeholders to review materials, discuss tactics for accomplishing project goals, and generate new ideas for achieving the goal. When Khlong Seven community members are involved with implementation of the study project, they become partners with the project staff and share the responsibility for the results and ultimate effectiveness of the project. The research is meaningful to farmer’s living in the communities and also directly benefits their family and their children through the sharing of knowledge and resources ongoing with the project and the development of culturally sensitive intervention strategies. Accessing to a low-income, urban population that had not previously participated in research is a major benefit, particularly when the study requires gaining access to the participants’ homes. Community partners act as an important bridge between the study investigators and a culturally, linguistically, and economically diverse population. The community partners also play a significant role in shaping an intervention design that is realistic and can be implemented, thus reflecting and taking into consideration cultural and socioeconomic variables and conditions.

5.3 Conclusion

The rice farmer participants learned that they had a potentially dangeroussituation in the fields and their homes, perceived agrochemical risks, gained knowledge through agrochemical safety behaviors, and ultimately took the necessary steps of incorporating safety recommendations for their families and their community. In conclusion, this intervention model appeared to be effective in improving agrochemical safety behaviors among the Khlong Seven community rice farmer participants. The rice farmers may be able to ameliorate of the agrochemical hazards if they follow the recommendations seriously. It is proposed that, this model may benefit other vulnerable groups such as maize farmers, orange orchadists and chili farmers. However, as noted earlier, the researcher needs to be aware and sensitive to variations in belief systems and behaviors across different regions.

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APPENDICES

Appendix A

IRB Certificate of Approval

COA No. 090/2010

Certificate of Approval

Study Title No.041.2/53 : **MULTI APPROACH MODEL FOR IMPROVING AGROCHEMICAL SAFETY AMONG FARMERS IN PATHUMTHANI, THAILAND**

Principle Investigator : Miss Buppha Raksanam

Place of Proposed Study/Institution : College of Public Health Sciences, Chulalongkorn University

The Ethical Review Committee for Research Involving Human Research Subjects, Health Science Group, Chulalongkorn University, Thailand, has approved constituted in accordance with the International Conference on Harmonization – Good Clinical Practice (ICH-GCP) and/or Code of Conduct in Animal Use of NRCT version 2000.

Signature: .... Signature: ....

(Associate Professor Prida Tasanapradit, M.D.) (Assistant Professor Dr. Nuntaree Chaichanawongsaroj)

Chairman Secretary

Date of Approval : 7 September 2010 Approval Expire date : 6 September 2011

Protocol No. 041.2/53
Date of Approval 07 SEP 2010
Approval Expire Date 06 SEP 2011

The approval documents including

1) Research proposal
2) Patient/Participant Information Sheet and Informed Consent Form
3) Researcher
4) Questionnaire

The approved investigator must comply with the following conditions:

1. The research/project activities must end on the approval expired date of the Ethical Review Committee for Research Involving Human Research Subjects, Health Science Group, Chulalongkorn University (ECCU). In case the research/project is unable to complete within that date, the project extension can be applied one month prior to the ECCU approval expired date.
2. Strictly conduct the research/project activities as written in the proposal.
3. Using only the documents that bearing the ECCU's seal of approval with the subjects/volunteers (including subject information sheet, consent form, invitation letter for project/research participation (if available); and

Appendix B

Informed Consent Form (Phase 1)

หนังสือแสดงความยินยอมเข้าร่วมการวิจัย (ระยะที่ 1)

ทำที่...

วันที่............เดือน....................พ.ศ. ....

เลขที่ ประชากรตัวอย่างหรือผู้มีส่วนร่วมในการวิจัย…..................…..

ข้าพเจ้า ซึ่งได้ลงนามท้ายหนังสือนี้ ขอแสดงความยินยอมเข้าร่วมโครงการวิจัย

ชื่อโครงการวิจัย: รูปแบบการให้ความรู้แบบบูรณาการ เพื่อความปลอดภัยในการใช้สารเคมีทางการเกษตรกรรมของชาวนาในจังหวัดปทุมธานี **(สำรวจสถานการณ์ ความรู้ ความเชื่อและพฤติกรรมต่อการใช้สารเคมีทางการเกษตร ของชาวนาตำบลคลองเจ็ด อำเภอคลองหลวง จังหวัดปทุมธานี)**

ชื่อผู้วิจัย น.ส. บุบผา รักษานาม นิสิตปริญญาเอก วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

ที่อยู่ที่ติดต่อที่ทำงาน: วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

ชั้น 10 อาคารสถาบัน 3 ซ. จุฬาฯ 62 ถ.พญาไท แขวงวังใหม่ เขตปทุมวัน กทม. 10330

ที่อยู่ที่ติดต่อที่บ้าน: 89/18 หมู่ 2 ต.ควนธานี อ.กันตัง จ.ตรัง 92110

โทรศัพท์ (ที่ทำงาน) 0-2218-8152-3 **โทรศัพท์ที่บ้าน** 089-4700804

โทรศัพท์มือถือ 089-470080 **E-mail address:** sorayanarak@hotmail.com

ข้าพเจ้า **ได้รับทราบ** รายละเอียดเกี่ยวกับที่มาและวัตถุประสงค์ในการทำวิจัย รายละเอียดขั้นตอนต่างๆ ที่จะต้องปฏิบัติหรือได้รับการปฏิบัติ ความเสี่ยง/อันตราย และประโยชน์ซึ่งจะเกิดขึ้นจากการวิจัยเรื่องนี้ โดยได้อ่านรายละเอียดในเอกสารชี้แจงผู้เข้าร่วมการวิจัยโดยตลอด และ**ได้รับคำอธิบาย**จากผู้วิจัย **จนเข้าใจเป็นอย่างดี**แล้ว

ข้าพเจ้าจึง**สมัครใจ**เข้าร่วมในโครงการวิจัยนี้ ตามที่ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย โดยข้าพเจ้ามีสิทธิ **ถอนตัว**ออกจากการวิจัยเมื่อใดก็ได้ตามความประสงค์ **โดยไม่ต้องแจ้งเหตุผล** ซึ่งการถอนตัวออกจากการวิจัยนั้น จะไม่มีผลกระทบในทางใดๆ ต่อข้าพเจ้าทั้งสิ้น

ข้าพเจ้าได้รับคำรับรองว่า ผู้วิจัยจะปฏิบัติต่อข้าพเจ้าตามข้อมูลที่ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย และข้อมูลใดๆ ที่เกี่ ยวข้องกับข้าพเจ้า ผู้วิจัยจะ **เก็บรักษาเป็นความลับ** โดยจะนำเสนอข้อมูลการวิจัยเป็นภาพรวมเ ท่านั้น ไม่มีข้อมูลใดในการรายงานที่จะนำไปสู่การระบุตัวข้าพเจ้า

หากข้าพเจ้าไม่ได้รับการปฏิบัติตรงตามที่ได้ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย ข้าพเจ้าสามารถร้องเรียนได้ที่คณะกรรมการพิจารณาจริยธรรมการวิจัยในคน กลุ่มสหสถาบัน ชุดที่ 1 จุฬาลงกรณ์มหาวิทยาลัย ชั้น 4 อาคารสถาบัน 2 ซอยจุฬาลงกรณ์ 62 ถนนพญาไท เขตปทุมวัน กรุงเทพฯ 10330

โทรศัพท์ 0-2218-8147 โทรสาร 0-2218-8147 **E-mail: eccu@chula.ac.th**

ข้าพเจ้าได้ลงลายมือชื่อไว้เป็นสำคัญต่อหน้าพยาน ทั้งนี้ข้าพเจ้าได้รับสำเนาเอกสารชี้แจงผู้เข้าร่วมการวิจัย และสำเนาหนังสือแสดงความยินยอมไว้แล้ว

ลงชื่อ..	ลงชื่อ..
(...)	(...)
ผู้วิจัยหลัก	ผู้มีส่วนร่วมในการวิจัย

ลงชื่อ..

(...)

พยาน

Appendix C
Informed Consent Form (Phase 2)

หนังสือแสดงความยินยอมเข้าร่วมการวิจัย (ระยะที่ 2)

ทำที่..

วันที่............เดือน.....................พ.ศ. ....

เลขที่ ประชากรตัวอย่างหรือผู้มีส่วนร่วมในการวิจัย…................……

ข้าพเจ้า ซึ่งได้ลงนามท้ายหนังสือนี้ ขอแสดงความยินยอมเข้าร่วมโครงการวิจัย

ชื่อโครงการวิจัย: รูปแบบการให้ความรู้แบบบูรณาการ เพื่อความปลอดภัยในการใช้สารเคมีทางการเกษตรกรรมของชาวนาในจังหวัดปทุมธานี

ชื่อผู้วิจัย น.ส. บุบผา รักษานาม นิสิตปริญญาเอก วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

ที่อยู่ที่ติดต่อที่ทำงาน: วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

ชั้น 10 อาคารสถาบัน 3 ซ. จุฬาฯ 62 ถ.พญาไท แขวงวังใหม่ เขตปทุมวัน กทม. 10330

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ข้าพเจ้า **ได้รับทราบ** รายละเอียดเกี่ยวกับที่มาและวัตถุประสงค์ในการทำวิจัย รายละเอียดขั้นตอนต่างๆ ที่จะต้องปฏิบัติหรือได้รับการปฏิบัติ ความเสี่ยง /อันตราย และประโยชน์ซึ่งจะเกิดขึ้นจากการวิจัยเรื่องนี้ โดยได้อ่านรายละเอียดในเอกสารชี้แจงผู้เข้าร่วมการวิจัยโดยตลอด และ**ได้รับคำอธิบาย**จากผู้วิจัย **จนเข้าใจเป็นอย่างดี**แล้ว

ข้าพเจ้าจึง**สมัครใจ**เข้าร่วมในโครงการวิจัยนี้ ตามที่ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย โดยข้าพเจ้ามีสิทธิ **ถอนตัว**ออกจากการวิจัยเมื่อใดก็ได้ตามความประสงค์ **โดยไม่ต้องแจ้งเหตุผล** ซึ่งการถอนตัวออกจากการวิจัยนั้น จะไม่มีผลกระทบในทางใดๆ ต่อข้าพเจ้าทั้งสิ้น

ข้าพเจ้าได้รับคำรับรองว่า ผู้วิจัยจะปฏิบัติต่อข้าพเจ้าตามข้อมูลที่ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย และข้อมูลใดๆ ที่เกี่ยวข้องกับข้าพเจ้า ผู้วิจัยจะ**เก็บรักษาเป็นความลับ** โดยจะนำเสนอข้อมูลการวิจัยเป็นภาพรวมเท่านั้น ไม่มีข้อมูลใดในการรายงานที่จะนำไปสู่การระบุตัวข้าพเจ้า

หากข้าพเจ้าไม่ได้รับการปฏิบัติตรงตามที่ได้ระบุไว้ในเอกสารชี้แจงผู้เข้าร่วมการวิจัย ข้าพเจ้าสามารถร้องเรียนได้ที่ คณะกรรมการพิจารณาจริยธรรมการวิจัยในคน กลุ่มสหสถาบัน ชุดที่ 1 จุฬาลงกรณ์มหาวิทยาลัย ชั้น 4 อาคารสถาบัน 2 ซอยจุฬาลงกรณ์ 62 ถนนพญาไท เขตปทุมวัน กรุงเทพฯ 10330

โทรศัพท์ 0-2218-8147 โทรสาร 0-2218-8147 **E-mail: eccu@chula.ac.th**

ข้าพเจ้าได้ลงลายมือชื่อไว้เป็นสำคัญต่อหน้าพยาน ทั้งนี้ข้าพเจ้าได้รับสำเนา เอกสารชี้แจงผู้เข้าร่วมการวิจัย และสำเนาหนังสือแสดงความยินยอมไว้แล้ว

ลงชื่อ..	ลงชื่อ..
(...)	(...)
ผู้วิจัยหลัก	ผู้มีส่วนร่วมในการวิจัย
	ลงชื่อ..
	(...)
	พยาน

Appendix D
Participant Information sheet (Phase1)

ข้อมูลสำหรับผู้มีส่วนร่วมในการวิจัย (สำหรับการศึกษาระยะที่ 1)

ชื่อโครงการวิจัย รูปแบบการให้ความรู้แบบบูรณาการ เพื่อความปลอดภัยในการใช้สารเคมีทางการเกษตรกรรมของชาวนาในจังหวัดปทุมธานี

ชื่อผู้วิจัย น.ส. บุบผา รักษานาม นิสิตปริญญาเอก วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์-มหาวิทยาลัย
ที่อยู่ที่ติดต่อที่ทำงาน: วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย
ชั้น 10 อาคารสถาบัน 3 ซ. จุฬาฯ 62 ถ.พญาไท แขวงวังใหม่ เขตปทุมวัน กทม. 10330
ที่อยู่ที่ติดต่อที่บ้าน: 89/18 หมู่ 2 ต.ควนธานี อ.กันตัง จ.ตรัง 92110
โทรศัพท์ (ที่ทำงาน) 0-2218-8152-3 **โทรศัพท์ที่บ้าน** 089-4700804
โทรศัพท์มือถือ 089-4700804 **E-mail address:** sorayanarak@hotmail.com

1. ขอเรียนเชิญท่านเข้าร่วมในการวิจัย ก่อนที่ท่านจะตัดสินใจเข้าร่วมในการวิจัย มีความจำเป็นที่ท่านควรทำความเข้าใจว่างานวิจัยนี้ทำเพราะเหตุใด และเกี่ยวข้องกับอะไร กรุณาใช้เวลาในการอ่านข้อมูลต่อไปนี้อย่างละเอียดรอบคอบ และสอบถามข้อมูลเพิ่มเติมหรือข้อมูลที่ไม่ชัดเจนได้ตลอดเวลา

2. โครงการวิจัยนี้เป็นโครงการที่เกี่ยวข้องกับการสร้างและพัฒนา รูปแบบการให้ความรู้แบบบูรณาการ เพื่อให้กลุ่ม เกษตรกรที่มีการใช้สารเคมีทางการเกษตรที่มีความเสี่ยงต่อการสัมผัสอันตรายจากสารเคมีทางการเกษตรกรรมได้ตระหนักถึงอั นตรา ยและความปลอดภัยในการใช้สารเคมีทางการเกษตรมากขึ้น รูปแบบการวิจัยต้องอาศัยการการมีส่วนร่วมและความร่วมมือของชุมชนในตำบลเจ็ดรังสิตเป็นแรงขับเคลื่อนที่สำคัญให้เกิดความสำเร็จ

3. วัตถุประสงค์ของการวิจัย

1) พัฒนารูปแบบการให้ความรู้แบบบูรณาการ เพื่อให้กลุ่มเกษตรกรที่ใช้สารเคมีทางการเกษตรกรรมและมีความเสี่ยงต่อการสัมผัสอันตรายจากสารเคมีทางการเกษตรกรรมให้ปลอดภัยมากขึ้น

2) กระตุ้นและส่งเสริมให้กลุ่มเกษตรกร โดยเฉพาะชาวนาได้ตระหนักถึงอันตรายและความปลอดภัยในการใช้สารเคมีทางการเกษตรกรรมมากขึ้น โดยเฉพาะอย่างยิ่งประเด็นความปลอดภัยจากสารเคมีทางการเกษตรกรรมในและบริเวณรอบบ้าน

3) เพื่อประเมินประสิทธิภาพของรูปแบบการให้ความรู้แบบบูรณาการเรื่องความปลอดภัยในการใช้สารเคมีทางการเกษตรกรรมของชาวนาในจังหวัดปทุมธานี

4. ประชากรหรือผู้มีส่วนร่วมในการวิจัย คือเกษตรกรที่ใช้สารเคมีกำจัดศัตรูพืชอย่างน้อย 1 ปีขึ้นไป อายุระหว่าง 20 -65 ปี จำนวนทั้งหมด 394 คน โดยเลือกจากกลุ่มชาวนาในตำบลคลองเจ็ดรังสิต

5. หลังจากเสร็จสิ้นการวิจัยแล้วข้อมูลที่เกี่ยวข้องกับผู้มีส่วนร่วมในการวิจัยจะถูกทำลาย เช่น จะทำลายแถบบันทึกเสียง ข้อมูลส่วนตัว หรือบันทึกความเห็น หรือการบันทึกภาพ เป็นต้น

6. ประโยชน์ที่คาดว่าจะได้รับของการศึกษาในครั้งนี้

เป็นฐานข้อมูลในการหา แนวทางแบบการให้ความรู้แก่เกษตรกรกลุ่มชาวนาเกี่ยวกับการใช้สารเคมีทางเกษตรกรรมอย่าง ถูกต้องปลอดภัยและก่อให้เกิดกระบวนการเรียนรู้อย่างต่อเนื่องและยั่งยืนมีคุณค่าต่อเกษตรกร โดยที่เกษตรกรมีความเข้าใจและสามารถนำความความรู้มาใช้ได้จริง ทั้งยังเห็นคุณค่าในโครงการวิจัยนี้และช่วย เหลือกันเองโดยร่วมมือกันรณรงค์เอลดการใช้สารเคมีทางการเกษตรเพื่อชุมชนของตนเองได้เองต่อไปในภายภาคหน้า

7. วิธีการหรือรูปแบบการ สร้างความปลอดภัยและลดการใช้สารเคมีทางการเกษตรควรมีการดำเนินการร่วมกันระหว่างหน่วยงานที่เกี่ยวข้องทั้งด้านกระบวนการผลิต กระบวนการตลาด และการประกันคุณภาพและราคาผลผลิตผักปลอดสารพิษจึงจะนำไปสู่กระบวนการเรียนรู้ที่ยั่งยืน

7. ผู้มีส่วนร่วมในการวิจัยเป็น ไปโดย**สมัครใจ** และสามารถ **ปฏิเสธ** ที่จะเข้าร่วมหรือ **ถอนตัว** จากการวิจัยได้ทุกขณะ โดยไม่ต้องให้เหตุผลและไม่สูญเสียประโยชน์ที่พึงได้รับ

8. ผู้เข้าร่วมโครงการวิจัยทั้งกลุ่มทดลองและกลุ่มควบคุมจะได้รับ ค่าพาหนะ ค่าชดเชยการเสียเวลาและของที่ระลึกซึ่งผู้วิจัยจะพิจารณาตามความเหมาะสมกับสถานการณ์

9. หากท่านมีข้อสงสัยให้สอบถามเพิ่มเติมได้โดยสามารถติดต่อผู้วิจัยได้ตลอดเวลา และหากผู้วิจัยมีข้อมูลเพิ่มเติมที่เป็นประโยชน์หรือโทษเกี่ยวกับการวิจัย ผู้วิจัยจะแจ้งให้ท่านทราบอย่างรวดเร็ว

10. ข้อมูลที่เกี่ยวข้องกับท่านจะเก็บเป็น **ความลับ** หากมีการเสนอผลการวิจัยจะเสนอเป็นภาพรวมข้อมูลใดที่สามารถระบุถึงตัวท่านได้จะไม่ปรากฏในรายงานวิจัย

11. หากท่านไม่ได้รับการปฏิบัติ ตามข้อมูลดังกล่าวสามารถร้องเรียนได้ที่ คณะกรรมการพิจารณาจริยธรรมการวิจัยในคน กลุ่มสหสถาบัน ชุดที่ 1 จุฬาลงกรณ์มหาวิทยาลัย ชั้น 4 อาคารสถาบัน 2 ซอยจุฬาลงกรณ์ 62 ถนนพญาไท เขตปทุมวัน กรุงเทพฯ 10330 โทรศัพท์ 0-2218-8147 โทรสาร 0-2218-8147 E-mail: eccu@chula.ac.th

Appendix E

Participant Information sheet (Phase2)

ข้อมูลสำหรับผู้มีส่วนร่วมในการวิจัย (สำหรับการศึกษาระยะที่ 2)

ชื่อโครงการวิจัย รูปแบบการให้ความรู้แบบบูรณาการ เพื่อความปลอดภัยในการใช้สารเคมีทางการเกษตรกรรมของชาวนาในจังหวัดปทุมธานี

ชื่อผู้วิจัย น.ส. บุบผา รักษานาม นิสิตปริญญาเอก วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์-มหาวิทยาลัย

ที่อยู่ที่ติดต่อที่ทำงาน: วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

ชั้น 10 อาคารสถาบัน 3 ซ. จุฬาฯ 62 ถ.พญาไท แขวงวังใหม่ เขตปทุมวัน กทม. 10330

ที่อยู่ที่ติดต่อที่บ้าน: 89/18 หมู่ 2 ต.ควนธานี อ.กันตัง จ.ตรัง 92110

โทรศัพท์ (ที่ทำงาน) 0-2218-8152-3 **โทรศัพท์ที่บ้าน** 089-4700804

โทรศัพท์มือถือ 089-4700804 **E-mail address:** sorayanarak@hotmail.com

1. ขอเรียนเชิญท่านเข้าร่วมในการวิจัย ก่อนที่ท่านจะตัดสินใจเข้าร่วมในการวิจัย มีความจำเป็นที่ท่านควรทำความเข้าใจว่างานวิจัยนี้ทำเพราะเหตุใด และเกี่ยวข้องกับอะไร กรุณาใช้เวลาในการอ่านข้อมูลต่อไปนี้อย่างละเอียดรอบคอบ และสอบถามข้อมูลเพิ่มเติมหรือข้อมูลที่ไม่ชัดเจนได้ตลอดเวลา

2. โครงการวิจัยนี้เป็นโครงการที่เกี่ยวข้องกับการสร้างและพัฒนา รูปแบบการให้ความรู้แบบบูรณาการ เพื่อให้กลุ่ม เกษตรกรที่มีการใช้สารเคมีทางการเกษตรที่มีความเสี่ยงต่อการสัมผัสอันตรายจากสารเคมีทางการเกษตรกรรมได้ตระหนักถึงอั นตรา ยและความปลอดภัยในการใช้สารเคมีทางการเกษตรมากขึ้น รูปแบบการวิจัยต้องอาศัยการการมีส่วนร่วมและความร่วมมือของชุมชนในตำบลเจ็ดรังสิตเป็นแรงขับเคลื่อนที่สำคัญให้เกิดความสำเร็จ

3. วัตถุประสงค์ของการวิจัย

1) พัฒนารูปแบบการให้ความรู้แบบบูรณาการ เพื่อให้กลุ่มเกษตรกรที่ใช้สารเคมีทางการเกษตรกรรมและมีความเสี่ยงต่อการสัมผัสอันตรายจากสารเคมีทางการเกษตรกรรมให้ปลอดภัยมากขึ้น

2) กระตุ้นและส่งเสริมให้กลุ่มเกษตรกร โดยเฉพาะชาวนาได้ตระหนักถึงอันตรายและความปลอดภัยในการใช้สารเคมีทางการเกษตรกรรมมากขึ้น โดยเฉพาะอย่างยิ่งประเด็นความปลอดภัยจาก*สารเคมีทางการเกษตรกรรมในและบริเวณรอบบ้าน*

3) เพื่อประเมินประสิทธิภาพของรูปแบบการให้ความรู้แบบบูรณาการเรื่องความปลอดภัยในการใช้สารเคมีทางการเกษตรกรรมของชาวนาในจังหวัดปทุมธานี

4. ประชากรหรือผู้มีส่วนร่วมในการวิจัย คือเกษตรกรที่ใช้สารเคมีกำจัดศัตรูพืชอย่างน้อย 1 ปีขึ้นไป อายุระหว่าง *20 -65* ปี จำนวนทั้งหมด 482 คน โดยเลือกจากกลุ่มชาวนาในตำบลคลองเจ็ดรังสิต

5. หลังจากเสร็จสิ้นการวิจัยแล้วข้อมูลที่เกี่ยวข้องกับผู้มีส่วนร่วมในการวิจัยจะถูกทำลาย เช่น จะทำลายแถบบันทึกเสียง ข้อมูลส่วนตัว หรือบันทึกความเห็น หรือการบันทึกภาพ เป็นต้น

6. ประโยชน์ที่คาดว่าจะได้รับของการศึกษาในครั้งนี้

เป็นฐานข้อมูลในการหา แนวทางแบบการให้ความรู้แก่เกษตรกรกลุ่มชาวนาเกี่ยวกับการใช้สารเคมีทางเกษตรกรรมอย่าง ถูกต้องปลอดภัยและก่อให้เกิดกระบวนการเรียนรู้อย่างต่อเนื่องและยั่งยืนมีคุณค่าต่อเกษตรกร โดยที่เกษตรกรมีความเข้าใจและสามารถนำความความรู้มาใช้ได้จริง ทั้งยังเห็นคุณค่าในโครงการวิจัยนี้และช่วย เหลือกันเองโดยร่วมมือกันรณรงค์เอลดการใช้สารเคมีทางการเกษตรเพื่อชุมชนของตนเองได้เองต่อไปในภายภาคหน้า

7. วิธีการหรือรูปแบบการ สร้างความปลอดภัยและลดการใช้สารเคมีทางการเกษตรควรมีการดำเนินการร่วมกันระหว่างหน่วยงานที่เกี่ยวข้องทั้งด้านกระบวนการผลิต กระบวนการตลาด และการประกันคุณภาพและราคาผลผลิตผักปลอดสารพิษจึงจะนำไปสู่กระบวนการเรียนรู้ที่ยั่งยืน

7. ผู้มีส่วนร่วมในการวิจัยเป็น ไปโดย**สมัครใจ** และสามารถ **ปฏิเสธ** ที่จะเข้าร่วมหรือ **ถอนตัว** จากการวิจัยได้ทุกขณะ โดยไม่ต้องให้เหตุผลและไม่สูญเสียประโยชน์ที่พึงได้รับ

8. ผู้เข้าร่วมโครงการวิจัยทั้งกลุ่มทดลองและกลุ่มควบคุมจะได้รับ ค่าพาหนะ ค่าชดเชยการเสียเวลาและของที่ระลึกซึ่งผู้วิจัยจะพิจารณาตามความเหมาะสมกับสถานการณ์

9. หากท่านมีข้อสงสัยให้สอบถามเพิ่มเติมได้โดยสามารถติดต่อผู้วิจัยได้ตลอดเวลา และหากผู้วิจัยมีข้อมูลเพิ่มเติมที่เป็นประโยชน์หรือโทษเกี่ยวกับการวิจัย ผู้วิจัยจะแจ้งให้ท่านทราบอย่างรวดเร็ว

10. ข้อมูลที่เกี่ยวข้องกับท่านจะเก็บเป็น **ความลับ** หากมีการเสนอผลการวิจัยจะเสนอเป็นภาพรวม ข้อมูลใดที่สามารถระบุถึงตัวท่านได้จะไม่ปรากฏในรายงานวิจัย

11. หากท่านไม่ได้รับการปฏิบัติตามข้อมูลดังกล่าวสามารถร้องเรียนได้ที่ คณะกรรมการพิจารณาจริยธรรมการวิจัยในคน กลุ่มสหสถาบัน ชุดที่ 1 จุฬาลงกรณ์มหาวิทยาลัย ชั้น 4 อาคารสถาบัน 2 ซอยจุฬาลงกรณ์ 62 ถนนพญาไท เขตปทุมวัน กรุงเทพฯ 10330 โทรศัพท์ 0-2218-8147 โทรสาร 0-2218-8147 E-mail: eccu@chula.ac.th

Appendix F

Interview forms

Questionnaire: Knowledge, Beliefs, Behaviors of Agrochemical Utilization, In-home pesticide safety assessment, and community participation among Farmers in Pathumthani province, Thailand

Participant's No……………………Date…………..……Start – End Time……………………

Address No…….Moo…Sub-district……..……Khlong Lung disdrict, Pathumthani Province

Introduction of the questionnaire

1. The questionnaire is divided into 6 parts as follows:

   Part 1 General data (10 questions)

   Part 2 Knowledge of agrochemical use (22 questions)

   Part 3 Beliefs on agrochemical use (22 questions)

   Part 4 Behaviors of agrochemical use (20 questions)

   Part 5 In-home pesticide safety assessment

   Part 6 Spider-gram questionnaire of community participation
2. Please select (/) the answer for each question
3. "Agrochemical" in this study mainly focuses on pesticide
4. Participant's signature…………………………………………………………………..

Part 1: General data

Instruction: Please answer the questions in the space provided or choose the answer by marking (/) in the relevant brackets

1. Age …………… Years

2. Gender ( ) 1.Male ( ) 2.Female

3. Marital Status

( ) 1.Single ( ) 2.Married ( ) 3.Widowed ( ) 4.Divorced ( ) 5. Separated

4. Highest Education level

( ) 1. None ( ) 5. Diploma

() 2. Primary school ( ) 6. Bachelor

( ) 3. Secondary school (Grade1) ( ) 7. Higher than bachelor

( ) 4. Secondary school (Grade2) ( ) 8.Other………………….

5. Type of ownership

( ) 1.Owner ( ) 2.Renter ( ) 3.Owner and renter

6. Monthly income…. ……………………………..………………baht

7. How long have you lived in this community?………………………years

8. How long have you worked in an agricultural occupation?…………….years

9. How long have you used agrochemicals, especially pesticides?…….years

10. Frequency of pesticide application per month during rice growing season.

( ) 1.Once ( ) 2.Twice ( ) 3.Three times ( ) 4.Four times ( ) 5.Other ……..……

Part 2: Knowledge on agrochemical use

The knowledge on agrochemical use questionnaire consists of knowledge and understanding about the correct agrochemical safety behaviors. Please select (/) the best answer.

1. How are you exposed to agrochemicals, especially pesticides?
   (1) Mouth
   (2) Inhalation
   (3) Skin
   (4) All of the above
2. What is the danger of agrochemicals, especially pesticides?
   (1) Harm to the body
   (2) Harm to all living things
   (3) Effect on the environment
   (4) All of the above
3. What does “Abamectin” do?
   (1) Gets rid of grass
   (2) Acts as a pest Control
   (3) Eliminates fungus
   (4) Increases productivity.
4. How do you select your agrochemical choices?
   (1) Select the right type and calculate the amount to be used.
   (2) Follow the neighbor’s instructions
   (3) Get the type that can get rid of many pests
   (4) Use a high concentration of agrochemicals
5. What is/are the most important point/s to consider when choosing agrochemicals?
   (1) The date of manufacture and expiry
   (2) Select the right type and calculate the amount to be used.
   (3) The type that can get rid of many pests
   (4) Both1 and2
6. How do you mix agrochemical safely?
   (1) Wear cotton gloves to handle and mix agrochemicals
   (2) Wear rubber gloves to handle and mix agrochemicals
   (3) Use bare hands to handle and mix agrochemicals
   (4) Use bare hands to handle the stick and mix agrochemicals

7. When should you spray pesticides?

(1) Calm winds

(2) High winds

(3) Sunny

(4) Any time

8. How should you dress while spraying agrochemicals, especially pesticides?

(1) Do not wear personal protective equipment because of the hot weather

(2) Do not use a mask because it is uncomfortable for breathing

(3) Wear clothes and mask to protect your body

(4) Wear shoes, clothes and mask to protect your body

9. What should you do, if the nozzle is clogged while you are spraying agrochemicals, especially pesticides?

(1) Use your bare hands to hold the nozzle and stab it with a stick or wire

(2) Wear rubber gloves to hold the nozzle and stab it with a stick or wire

(3) Directly hold the nozzle with your hands and wash it with water

(4) Blow or suck the nozzle with your mouth

10. Where can the poison from agrochemical especially pesticides accumulate?

(1) On the ground

(2) In the river

(3) On the ground and in the adjacent spray area

(4) All of the above

11. What is/are the hazards of agrochemical exposure, especially pesticide exposure?

(1) Anxious delirium.

(2) Abdominal pain, dizziness.

(3) Dizziness, dizzy throat

(4) All of the above

12. How should you first manage a person affected by pesticide poisoning?

(1) Give them medicine immediately

(2) Change their clothes which are dirty and then take a bath immediately

(3) Loosen the clothes

(4) Take him to hospital

13. Where should do you store agrochemical products?

(1) In the kitchen

(2) In the bathroom or the toilet

(3) In a special area with a locked room

(4) Anywhere in the house

14. What is/are the best method/s to get rid of used agrochemicals?

(1) Bury or burn them

(2) Leave them in the river or canal

(3) Leave them on the farm

(4) Both 1 and 2 are correct

15. Where does the poison from pesticides accumulate in the body?

(1) Blood circulation

(2) Adipose tissue

(3) Skin

(4) All of the above

16. Who is/are the potential risk/s to agrochemical exposure?

(1) A person who doesn't eat vegetables but eats only meat

(2) An infant

(3) A person who always uses pesticides

(4) All of the above

18. What is the correct method of agrochemical use?

(1) Use a high dose

(2) Follow product instruction

(3) Use expired agrochemicals

(4) 1 and 2 are correct

19. Which of the following is a correct practice of pesticide use?

(1) Clean agrochemical containers and materials in the river and canals

(2) Immediately take a bath after working

(3) Clean and reuse agrochemical containers in the kitchen

(4) All of the above

20. What is/are the correct practice/s?

(1) Mix all agrochemicals into the sprayer until the water is full, then shake sprayer

(2) Mix all agrochemicals into sprayer fill with water, then stir slightly

(3) Mix all agrochemicals in container, then fill in sprayer

(4) All of the above

21. Which of the following is a correct practice while spraying pesticide?

(1) Wear the full option of personal protective equipment

(2) Spray pesticide against the wind

(3) Smoke during the spraying of pesticide

(4) All of the above

22. What is/are the best and most comfortable way/s for you to know the toxicity of agrochemicals?

(1) Read the instructions and take a look at the risk symbols

(2) Smell and touch

(3) Send the samples to laboratory centers

(4) All of the above

Part 3: Beliefs on agrochemical use

Instruction: Please mark (/) in the bracket corresponding to your beliefs. You can choose only one answer.

The health beliefs in the agrochemical use questionnaire are divided into 4 sections:

1. Perceived susceptibility of agrochemical hazards
2. Perceived severity of agrochemical hazards
3. Perceived benefits of agrochemical safety
4. Perceived barriers to agrochemical safety

3.1 Perceived susceptibility of agrochemical hazards

Beliefs	**Strongly disagree**	**Disagree**	**Uncertain**	**Agree**	**Strongly agree**
1.Long term exposure to agrochemicals especially pesticides may lead to cancer					
2.Long term exposure to agrochemicals especially pesticides can affect the nervous system					
3. You can be exposed to agrochemicals by skin if you directly contact them without rubber gloves.					
4.Used agrochemical containers can be reused safely					
5.You can eat safely at a agrochemical spraying area					
6.You can drink safely at agrochemical safety area					
7. If you have good health, you can smoke safely while you are crop-dusting agrochemicals.					

3.2 Perceived severity of agrochemical hazards

Beliefs	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
1.If you are allergic to agrochemicals, you will be easily affected by other diseases					
2.Using agrochemical for long periods is not dangerous because the body is resistant to agrochemicals					
3.Despite the use of pesticide sin large quantities at the same time, it is not harmful to health					
4. As agrochemical exposure, especially to pesticides, for long periods is dangerous, the body can remove their toxicity.					

3.3 Perceived benefits of agrochemical safety

Beliefs	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
1. For your safety, you need to carefully read agrochemical use instructions before use and also strictly follow the instructions					
2.To reduce the risk of agrochemical hazards, you should spray in the same direction as the wind					
3.Taking a bath immediately after spraying can reduce the effects of agrochemical hazards					
4. You will get more benefits from wearing a full option of personal protective equipment					
5. For your safety and that of others, unrelated persons and animals should be not allowed into the spraying area					

3.3 Perceived barriers to agrochemical safety

Beliefs	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
1.Although wearing a long shirt and trousers is uncomfortable for work, you need to					
2.Althoughwearing a mask during working is uncomfortable for breathing, you need to do					
3. Although wearing rubber gloves while you are working is uncomfortable, you need to do					
4.Although wearing boots while you are working is uncomfortable, you need to do					
5.As providing a full option of personal protective equipment(such as hat, gloves, boots, mask) is hard for you, these are rarely used					
6.It is not necessary to separate agrochemical-contaminated clothes from others because of the money wasted					

Part 4: Behaviors of agrochemical use

Instruction: Please tick (/) in the brackets. You can choose only one answer for each item

Behaviors	**Always done**	**Often done**	**Sometime done**	**Rarely done**
1. Carefully read agrochemical use instructions before use and also strictly follow the instructions				
2.Checkthetools and equipment before working				
3.Use expired agrochemicals				
4.Take persons not related to work performance in the spraying area				
5.Leave food near/in the spraying area				
6. Open agrochemical container using your mouth				
7. Blow or suck the nozzle using your mouth				
8. Mix or stir agrochemicals with stick or safety equipment				
9. Stop working immediately when you get wounded during the spraying of pesticide				
10. Spray pesticide during strong winds				
11. Spray pesticide in the same direction as the wind				
12. Drink some water during working with agrochemicals				
13. Eat some food during work with agrochemicals				
14. Burn or landfill the expired or left over agrochemicals in the safety area				
15. Leave empty or expired containers in the river or canal				
16. Leave empty or expired containers in normal trash				
17.Wash agrochemical equipments, and agrochemical containers in the river or canal				
18.Take a bath immediately after finishing work related to agrochemical use				
19. Separate agrochemical contaminated clothes from others to clean				
20. Store agrochemicals in a locked area				

Part 5: In-home pesticide safety assessment

Instruction: Please tick (/) in the brackets. You select only one answer in each item

Statement	Yes	No
1. Leave agrochemicals in the bath room close to shower cream, mouthwash, detergents, etc.		
2. Leave agrochemicals in the kitchen close to dishwashing liquid, sauce, fish sauce and other condiments.		
3. Provide a storage area for agrochemicals, such as a closet or storage room, hard to reach for children.		
4. Provide a safety and locked room of agrochemicals		
5. Store agrochemicals in a storage area		
6. Store agrochemicals in a safe and locked room		
7. Leave your shirt and trousers stained with agrochemicals with your family's clothes.		
8. Separate for washing your shirt and trousers stained with agrochemicals from your family's clothes.		
9. Provide hazardous trash and general trash.		
10. Throw out agrochemical containers in general trash		
11. Provide the call numbers of hospitals, health centers, and toxicological centers (in case of emergency from agrochemical hazards)		
12. Easy to get emergency call numbers in your home (in case of an emergency from agrochemical hazards)		

Part 6: Spider-gram Questionnaire: community participation

Instruction: Please tick (/) in the brackets. You select only one answer in each item

Dimension of community participation	Minimal (score = 1)	Restricted (score = 2)	Fair (score = 3)	Open (score = 4)	Maximal (score = 5)
1. Community needs 1.1 Agricultural chemical risk behavior is an important issue needed to early concern.					
1.2 Getting an agricultural chemical safety behavior is benefit to your community.					
1.3 Agrochemical safety behavior strategies have been set into your community plans.					
2. Community leaders 2.1 Community leaders kindly support agrochemical safety behavior activities.					
2.2 Community leader decision is important to develop agrochemical safety behavior plans in the community.					
3. Resource mobilization 3.1 You can make a decision on agrochemical safety program allocations according to the existing resources (money, manpower, materials).					
4. Organizations 4.1 Agrochemical safety program has been supported by local community organizations. 4.2 Farmers can make a decision on agrochemical safety program activities in your community.					
5. Managements 5.1 In your community, the appropriate decision and management structures favored by agrochemical safety program committee create the improvement of your agrochemical safety behaviors.					

(Modified from Rifkin SB, et al, 1988 and Gunilla Bjaras, 1991)

Appendix G

Focus group discussion guidelines

Focus group discussion guidelines

1. What belief systems influence the farmers' perceived risk of agrochemical exposure?

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

2. What are farmer's beliefs regarding the severity, susceptibility, barriers and benefits of agrochemical exposure?

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

3. What observed work-related and socio-cultural factors modify agrochemical exposure risks?

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

4. What are the needs of farmers to improve agrochemical safety in the Khlong Seven community?

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

5. What are recommendations for establishing rice farmer guidelines for improving agrochemical safety in Khlong Seven?

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

Appendix H
Interview forms (Thai version)

แบบสัมภาษณ์

ความรู้ ความเชื่อ พฤติกรรมต่อการใช้สารเคมีทางการเกษตร, ความปลอดภัยจากการใช้สารเคมีทางการเกษตรที่บ้าน, และความร่วมมือของชุมชนเรื่องความปลอดภัยในการใช้สารเคมีทางการเกษตร ของชาวนาตำบลคลองเจ็ด อำเภอคลองหลวง จังหวัดปทุมธานี

เลขที่…………………..วันที่สัมภาษณ์………………………เวลาเริ่มต้น-สิ้นสุดการสัมภาษณ์………………

บ้านเลขที่…………หมู่…………ตำบล…………………………….…… อำเภอคลองหลวง จังหวัดปทุมธานี

คำชี้แจง

1. แบบสัมภาษณ์ แบ่งออกเป็น 6 ส่วน ดังนี้
   - ส่วนที่ 1 ข้อมูลทั่วไป
   - ส่วนที่ 2 ความรู้เรื่องการใช้สารเคมีทางการเกษตร
   - ส่วนที่ 3 ความเชื่อต่อการใช้สารเคมีทางการเกษตร
   - ส่วนที่ 4 พฤติกรรมความปลอดภัยในการใช้สารเคมีทางการเกษตร
   - ส่วนที่ 5 ความปลอดภัยจากการใช้สารเคมีทางการเกษตรที่บ้าน
   - ส่วนที่ 6 ความร่วมมือของชุมชนเรื่องความปลอดภัยในการใช้สารเคมีทางการเกษตร
2. ให้ใส่เครื่องหมาย (/) ลงใน ( ) หน้าข้อความที่ท่านเลือก
3. “สารเคมีที่ใช้ในการเกษตร” ในโครงการวิจัยนี้เน้นศึกษาเรื่องสารกำจัดศัตรูพืช
4. ลายมือชื่อผู้ให้สัมภาษณ์แสดงความยินดีและยินยอมในการให้ข้อมูล...

ส่วนที่ 1 ข้อมูลทั่วไป

คำแนะนำ: โปรดทำเครื่องหมาย / ในวงเล็บ ( ) หน้าข้อความ และกรอกข้อมูลลงในช่องว่างที่กำหนดให้

1. อายุ .... ปี

2. เพศ ( ) 1 ชาย ( ) 2 หญิง

3. สถานภาพ ( ) 1 โสด ( ) 2 แต่งงาน ( ) 3 หม้าย ( ) 4 หย่าร้าง ( ) 5 แยกกันอยู่

4. ระดับการศึกษาสูงสุด

( ) 1ไม่ได้เรียน
( ) 2 ประถมศึกษา (ป. 1 – ป. 6)
( ) 3 มัธยมต้น/เทียบเท่า
( ) 4 มัธยมปลาย/ปวช./เทียบเท่า
( ) 5 อนุปริญญา/ปวส. /เทียบเท่า
( ) 6 ปริญญาตรี
( ) 7 สูงปริญญาตรี
( ) 8 อื่นๆ (ระบุ)...

5. ที่ดินในการทำนาเป็นของตนเองหรือไม่

( ) 1 เป็นของตัวเอง ( ) 2 เช่า ( ) 3 ทั้งเป็นของตนเองและเช่า

6. รายได้ต่อเดือน...บาท

7. ท่านอยู่ในชุมชนนี้มาเป็นเวลา..ปี

8. ท่านทำอาชีพเกษตรกรรมมาเป็นเวลา...ปี

9. ท่านใช้สารเคมีทางการเกษตร เช่นสารเคมีกำจัดศัตรูพืชเป็นเวลา………….....................ปี

10. ความถี่ของการใช้สารเคมีกำจัดศัตรูพืชต่อเดือน

( ) 1หนึ่งครั้ง ( ) 2.สองครั้ง ( ) 3.สามครั้ง ( ) 4.สี่ครั้ง ( ) 5.อื่น ๆ (ระบุ)……………

ส่วนที่ 2 ความรู้เรื่องการใช้สารเคมีทางการเกษตร

<u>คำชี้แจง</u> โปรดทำเครื่องหมายหน้า / หน้าคำคำตอบที่ถูกที่สุดเพียง 1 ข้อ

1. สารเคมีทางการเกษตรสามารถเข้าสู่ร่างกายทางใด

( ) 1 ปาก

( ) 2 การหายใจ

( ) 3 ผิวหนัง

( ) 4 ถูกทุกข้อ

2. การใช้สารเคมีทางการเกษตรมีผลเสียอย่างไร

( ) 1 เป็นอันตรายต่อร่างกาย

( ) 2 เป็นอันตรายต่อสิ่งมีชีวิตทุกชนิด

( ) 3 มีผลต่อสิ่งแวดล้อมเท่านั้น

( ) 4 ถูกทุกข้อ

3. อะบาเม็คตินเป็นสารเคมีทางการเกษตรที่ใช้เพื่อวัตถุประสงค์ใด

( ) 1 กำจัดหญ้า

( ) 2 กำจัดแมลง

( ) 3 กำจัดเชื้อรา

( ) 4 เพิ่มผลผลิต

4. วิธีการเลือกใช้สารเคมีทางการเกษตรที่ถูกต้องควรทำอย่างไร

( ) 1 เลือกให้ตรงกับแมลงศัตรูพืช

( ) 2 เลือกตามคำแนะนำของเพื่อนบ้าน

( ) 3 เลือกชนิดที่สามารถกำจัดศัตรูพืชได้หลายอย่าง

( ) 4 เลือกชนิดที่มีความเข้มข้นของสารมากๆ

5. เวลาเลือกซื้อสารเคมีทางการเกษตรท่านควรคำนึงถึงข้อใดมากที่สุด

( ) 1 ดูวัน เดือน ปี ที่ผลิต และหมดอายุ

( ) 2 เลือกซื้อให้ตรงประเภทที่ต้องการใช้ และคำนวณปริมาณที่ต้องการใช้

( ) 3 เลือกชนิดที่สามารถกำจัดศัตรูพืชได้หลายอย่าง

( ) 4 ถูกทั้งข้อ 1 และ 2

6. ข้อใดเป็นวิธีการผสมสารเคมีทางการเกษตรที่ปลอดภัยที่สุด

( ) 1.สวมถุงมือผ้า และใช้อุปกรณ์ช่วยในการผสมสารเคมีทางการเกษตร

( ) 2.สวมถุงมือยาง และใช้อุปกรณ์ช่วยในการผสมสารเคมีทางการเกษตร

( ) 3.ใช้มือเปล่า และใช้อุปกรณ์ช่วยในการผสมสารเคมีทางการเกษตร

( ) 4.ใช้มือเปล่า และไม่ใช้ใช้อุปกรณ์ช่วยในการผสมสารเคมีทางการเกษตร

7. สภาพอากาศในข้อใดเหมาะในการฉีดพ่นสารเคมีทางการเกษตรมากที่สุด?

( ) 1 ลมสงบ

( ) 2 ลมแรง

( ) 3 แดดออกจัด

( ) 4 เวลาใดก็ได้

8. ขณะที่พ่นสารเคมีทางการเกษตร ท่านควรแต่งกายอย่างไร?

( ) 1 ไม่สวมใส่เสื้อ เนื่องจากอากาศร้อน

( ) 2 ไม่ใส่ผ้าปิดจมูก เนื่องจากหายใจลำบาก

( ) 3 ใส่เสื้อผ้าแขนยาวและหน้ากากปกปิดร่างกาย

( ) 4 ใส่รองเท้า เสื้อผ้าแขนยาว และหน้ากากปกปิดร่างกาย

9. ท่านควรทำอย่างไรถ้าปลายกระบอกพ่นยาอุดตันขณะพ่นฆ่าแมลง?

( ) 1 ใช้มือเปล่าจับปลายกระบอกพ่นยาแล้วแหย่ด้วยไม้เล็ก ๆ หรือลวด

( ) 2 สวมถุงมือจับปลายกระบอกพ่นยาแล้วแหย่ด้วยไม้เล็ก ๆ หรือลวด

( ) 3 ใช้มือเปล่าจับปลายกระบอกพ่นยาและล้างด้วยน้ำเปล่า

( ) 4 ใช้ปากเป่าหรือดูดปลายกระบอกพ่นยา

10. สารตกค้างจากสารเคมีทางการเกษตรสามารถตกค้างได้บริเวณใด?

( ) 1 บนพื้นดิน

( ) 2 ในแม่น้ำ

( ) 3 บนพื้นดินและในแม่น้ำที่อยู่ใกล้เคียงพื้นที่ฉีดพ่น

( ) 4 ถูกทุกข้อ

11. ข้อใดคืออันตรายจากการสัมผัสยาฆ่าแมลง

( ) 1 กระวนกระวาย คุ้มคลั่ง

( ) 2 ปวดท้อง หน้ามืด

( ) 3 เวียนศีรษะ หน้ามืด ตาลาย คอแห้ง

( ) 4 ถูกทุกข้อ

12. การปฐมพยาบาลเบื้องต้น เมื่อถูกฆ่าแมลงหกโดนเสื้อผ้าควรทำอย่างไรเป็นอันดับแรก

( ) 1 ซื้อยามารับประทาน

( ) 2 เปลี่ยนเสื้อผ้าที่เปื้อนออกและอาบน้ำทันที

( ) 3 คลายเสื้อผ้าให้หลวม

( ) 4 ไปพบแพทย์ทันที

13. สารเคมีทางการเกษตรที่เหลือจากการใช้แล้วควรเก็บอย่างไร

( ) 1 เก็บไว้ในห้องครัว

( ) 2 เก็บไว้ในห้องน้ำ

( ) 3 เก็บใส่ตู้เก็บสารเคมีและมีกุญแจล็อค

( ) 4 เก็บไว้ในบริเวณบ้านที่หยิบได้ง่ายเพื่อสะดวกในการใช้

14. ภาชนะที่บรรจุสารเคมีทางการเกษตรที่ใช้หมดแล้วควรทำอย่างไร

( ) 1 เผาหรือฝังกลบในพื้นที่ปลอดภัย

( ) 2 ทิ้งในแม่น้ำลำคลอง

( ) 3 ทิ้งในพื้นที่การเกษตร

( ) 4 ถูกทั้งข้อ 1 และ ข้อ 2

15. สารเคมีทางการเกษตรสามารถสะสมได้อวัยวะส่วนใดของร่างกายมนุษย์

( ) 1 กระแสเลือด

( ) 2 เนื้อเยื่อไขมัน

( ) 3 ผิวหนัง

( ) 4 ถูกทุกข้อ

16. ใครมีโอกาสเสี่ยงต่อการสัมผัสสารเคมีทางการเกษตร

( ) 1 คนที่ไม่กินผักหรือพืชทุกชนิด

( ) 2 เด็กแรกเกิด

( ) 3 คนที่ใช้สารเคมีกำจัดศัตรูพืชเป็นประจำ

( ) 4 ถูกทุกข้อ

18. ข้อใดถูกต้องเกี่ยวกับการใช้สารเคมีทางการเกษตร

( ) 1 เลือกใช้สารเคมีทางการเกษตรที่มีความแรงสูง

( ) 2 ปฏิบัติตามคำแนะนำในฉลาก

( ) 3 ใช้สารเคมีทางการเกษตรที่หมดอายุ

( ) 4 ถูกทั้งข้อ 1 และ 2

19. ข้อใดถูกต้อง

( ) 1 ล้างภาชนะบรรจุสารเคมีทางการเกษตรในแม่น้ำลำคลอง

( ) 2 อาบน้ำทันหลังจากทำงานที่เกี่ยวกับสารเคมีทางการเกษตร

( ) 3 นำภาชนะบรรจุสารเคมีทางการเกษตรที่ล้างทำความสะอาดแล้วมาใช้ใส่อาหาร

( ) 4 ถูกทุกข้อ

20. ข้อใดถูกต้องเกี่ยวกับการผสมสารเคมีกำจัดศัตรูพืช?

( ) 1 ผสมสารเคมีกำจัดศัตรูพืชทุกชนิดในเครื่องพ่น เติมน้ำให้เต็ม แล้วเขย่าให้เข้ากัน

( ) 2 ผสมสารเคมีกำจัดศัตรูพืชทุกชนิดในเครื่องพ่น เติมน้ำให้เต็ม แล้วใช้ค่อยๆผสมให้เข้ากัน

( ) 3 ผสมสารเคมีกำจัดศัตรูพืชทุกชนิดในถังผสม เติมน้ำให้เต็ม แล้วเทใส่เครื่องพ่น

( ) 4 ใส่รองเท้า เสื้อผ้า และหน้ากากปกปิดร่างกาย

21. ข้อใดถูกต้องเกี่ยวกับการพ่นสารเคมีกำจัดศัตรูพืช

( ) 1 สวมอุปกรณ์ป้องกันตนเองแบบครบชุด

( ) 2 พ่นสารเคมีกำจัดศัตรูพืชทิศทางตรงข้ามกับลม

( ) 3 สูบบุหรี่ขณะพ่นสารเคมีกำจัดศัตรูพืช

( ) 4 ถูกทุกข้อ

22. เมื่อท่านต้องการหาข้อมูลเรื่องพิษและอันตรายของสารเคมีกำจัดศัตรูที่ท่านใช้อยู่ วิธีการใดง่าย สะดวกรวดเร็ว เหมาะที่สุดสำหรับท่าน

( ) 1 อ่านในฉลากและคำแนะนำในเอกสารกำกับ

( ) 2 สูดดมเพื่อทดสอบความเป็นพิษของสารเคมีนั้นๆ

( ) 3 ส่งตัวอย่างสารไปตรวจที่ห้องปฏิบัติการ

( ) 4 ถูกทุกข้อ

ส่วนที่ 3 ความเชื่อต่อการใช้สารเคมีทางการเกษตร

คำแนะนำ: โปรดทำเครื่องหมาย / ในช่องคำตอบตามความรู้สึก ความคิดเห็นหรือความเชื่อของท่าน

แบบสัมภาษณ์ความเชื่อต่อการใช้สารเคมีทางการเกษตรแบ่งออกเป็น 4 ส่วนย่อย ดังต่อไปนี้

3.1 ความเชื่อต่ออันตรายจากการใช้สารเคมีทางการเกษตร

3.2 ความเชื่อต่อความรุนแรงจากการใช้สารเคมีทางการเกษตรที่ไม่ปลอดภัย

3.3 ความเชื่อต่อประโยชน์จากการใช้สารเคมีทางการเกษตรอย่างปลอดภัย

3.4 ความเชื่อต่ออุปสรรคในการป้องกันอันตรายจากสารเคมีทางการเกษตร

3.1 ความเชื่อต่อโอกาสเสี่ยงจากอันตรายในใช้สารเคมีทางการเกษตร

ข้อคำถาม	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	ไม่แน่ใจ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
1. การสัมผัสสารเคมีทางการเกษตรต่อเนื่องเป็นเวลาหลายปี อาจนำไปสู่การเป็นมะเร็งได้					
2. การได้สารเคมีทางการเกษตรทำให้เกิดอันตรายต่อระบบประสาทได้					
3. หากท่านใช้มือเปล่าในการผสมสารเคมีทางการเกษตร สารเคมีทางการเกษตรอาจซึมเข้าสู่ผิวหนังได้					
4. ภาชนะที่ใช้ในการบรรจุสารเคมีทางการเกษตรสามารถล้างแล้วนำกลับมาใช้ใหม่ได้					
5. ท่านสามารถรับประทานอาหารได้อย่างปลอดภัยในพื้นที่ที่มีการพ่นสารเคมีทางการเกษตร					
6. ท่านสามารถดื่มน้ำได้อย่างปลอดภัยในพื้นที่ที่มีการพ่นสารเคมีทางการเกษตร					
7. ถ้าสุขภาพของท่านแข็งแรงท่านสามารถสูบบุหรี่ในขณะกำลังพ่นสารเคมีทางการเกษตรได้อย่างปลอดภัย					

3.2 การความเชื่อต่อความรุนแรงจากการใช้สารเคมีทางการเกษตร

ข้อคำถาม	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	ไม่แน่ใจ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
1. ผู้ที่มีอาการแพ้สารเคมีทางการเกษตรอาจทำให้เกิดอันตรายจากโรคแทรกซ้อนโรคอื่นได้ง่ายขึ้น					
2. การได้รับพิษจากสารเคมีทางการเกษตร ถ้าไม่สามารถช่วยได้ทันท่วงทีอาจทำให้เสียชีวิตได้					
3. แม้จะใช้สารเคมีทางการเกษตรในปริมาณมาก แต่ใช้ติดต่อกันไม่นานก็ไม่เป็นอันตรายต่อสุขภาพ					
4. การสัมผัสฆ่าแมลงเป็นเวลาหลายปี ทำให้ร่างกายของผู้สัมผัสมีภูมิต้านทานต่ออาการแพ้สารเคมีทางการเกษตร					

3.3 ความเชื่อต่อประโยชน์จากพฤติกรรมที่ปลอดภัยใช้จากสารเคมีทางการเกษตร

ข้อความ	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	ไม่แน่ใจ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
1. ท่านควรอ่านคำแนะนำก่อนใช้สารเคมีทางการเกษตรทุกครั้งเพื่อความปลอดภัยกับตัวท่านและบุคคลที่อยู่ใกล้เคียง					
2. เพื่อลดอันตรายจากการสัมผัสจากสารเคมีทางการเกษตร ท่านควรฉีดพ่นทิศทางเดียวกันกับลม					
3. ถ้าท่านอาบน้ำทันทีหลังจากใช้สารเคมีทางการเกษตรแล้วจะสามารถลดอันตรายจากการสัมผัสได้					
4. การสวมอุปกรณ์ป้องกันอันตรายแบบครบชุดทำให้ป้องกันอันตรายจากอาการแพ้พิษจากสารเคมีทางการเกษตรได้					
5. เพื่อหลีกเลี่ยงการสัมผัสสารเคมีทางการเกษตร ท่านควรนำบุคคลที่ไม่เกี่ยวข้องและสัตว์เลี้ยงออกจากบริเวณที่จะฉีดพ่น					

3.4 ความเชื่อต่ออุปสรรคในการป้องกันอันตรายของสารเคมีทางการเกษตร

ข้อความ	ไม่เห็นด้วยอย่างยิ่ง	ไม่เห็นด้วย	ไม่แน่ใจ	เห็นด้วย	เห็นด้วยอย่างยิ่ง
1. การสวมใส่เสื้อแขนยาว กางเกงขายาว ขณะฉีดพ่นสารเคมีทางการเกษตรทำให้การทำงานไม่สะดวก					
2. การใช้ผ้าปิดปากจมูก หรือหน้ากาก ขณะฉีดพ่นสารเคมีทางการเกษตรทำให้หายใจไม่สะดวก					
3. การสวมถุงมือยางทุกครั้ง เมื่อใช้สารเคมีทางการเกษตรทำให้เกิดความรำคาญ					
4. การสวมใส่รองเท้าบู๊ต ในการทำงานทำให้เดินและทำงานช้าลง					
5. การจัดหาชุดป้องกันอันตรายจากสารเคมีทางการเกษตรครบชุด เช่น หมวก ถุงมือ รองเท้าบู๊ต หน้ากาก ผ้ายาวกันเปื้อน เป็นสิ่งที่สิ้นเปลืองจึงไม่จัดหามาใช้					
6. การแยกซักเสื้อผ้าที่สวมใส่ในการฉีดพ่นสารเคมีทางการเกษตรจากเสื้อผ้าทั่วไปทำให้สิ้นเปลือง					

ส่วนที่ 4 พฤติกรรมความปลอดภัยในการใช้สารเคมีทางการเกษตร

คำชี้แจง โปรดทำเครื่องหมาย (/) ในช่องที่ตรงกับพฤติกรรมของท่านมากที่สุด

พฤติกรรม	ความถี่ในการปฏิบัติ			
	ไม่เคย	นานๆ ครั้ง	บ่อยครั้ง	ประจำ
1. อ่านฉลากคำแนะนำก่อนใช้สารเคมีทางการเกษตรทุกขั้นตอน				
2. ตรวจสอบเครื่องมือและอุปกรณ์ก่อนออกปฏิบัติงาน				
3. ใช้สารเคมีทางการเกษตรที่หมดอายุแล้ว				
4. นำผู้ไม่เกี่ยวข้องในการปฏิบัติงานออกจากบริเวณที่จะพ่นสารเคมีทางการเกษตร				
5. วางอาหารไว้ใกล้บริเวณที่ฉีดพ่นสารเคมีทางการเกษตร				
6. ใช้ปากเปิดภาชนะบรรจุสารเคมีทางการเกษตร				
7.ใช้ปากดูดหรือเป่าเมื่อท่อฉีดสารเคมีทางการเกษตรตัน				
8.ใช้ไม้หรืออุปกรณ์อื่นช่วยในการคนหรือผสมสารเคมีทางการเกษตร				
9. เมื่อได้รับบาดแผลในระหว่างการฉีดพ่นสารเคมีทางการเกษตรแล้วหยุดทันที				
10. ฉีดพ่นสารเคมีทางการเกษตรในขณะลมแรง				
11. ขณะฉีดพ่นสารเคมีทางการเกษตรอยู่เหนือทิศทางลม				
12. ดื่มน้ำในระหว่างการฉีดพ่นสารเคมีทางการเกษตร				
13. รับประทานอาหารในระหว่างการฉีดพ่นสารเคมีทางการเกษตร				
14. นำภาชนะที่ใส่สารเคมีทางการเกษตรที่ใช้หมดแล้วไปเผาหรือฝังกลบ				
15. ทิ้งภาชนะบรรจุสารเคมีทางการเกษตรลงในแหล่งน้ำลำคลอง				
16. ทิ้งภาชนะบรรจุสารเคมีทางการเกษตรลงในถังขยะทั่วไป				
17. ล้างภาชนะบรรจุสารเคมีทางการเกษตรในแหล่งน้ำลำคลอง				
18. อาบน้ำทันทีล้างจากฉีดพ่นสารเคมีทางการเกษตรเรียบร้อยแล้ว				
19. แยกซักชุดที่ใช้ในการพ่นสารเคมีทางการเกษตรออกออกจากการซักเสื้อผ้าทั่วไป				
20. เก็บสารเคมีทางการเกษตรในตู้หรือบริเวณเฉพาะสำหรับเก็บสารเคมีทางการเกษตร				

(Modified from: Ali W et al., Glanz K et al, 2002, W. Jariya, 2006, W.Sorat, 2004)

<u>ส่วนที่ 5</u> ความปลอดภัยจากใช้สารเคมีทางการเกษตรบริเวณบ้าน

คำชี้แจง กรุณาทำเครื่องหมาย ✓ ในช่อง "ใช่" หรือ "ไม่ใช่" ตามความเป็นจริงและจากที่ท่านสังเกตเห็น

ข้อคำถาม	ใช่	ไม่ใช่
1.วางสารเคมีทางการเกษตรปนกับผลิตภัณฑ์ต่างๆที่อยู่ในห้องน้ำ เช่น ครีมอาบน้ำ น้ำยาบ้วนปาก ผงซักฟอก เป็นต้น		
2. วางสารเคมีทางการเกษตรปนกับผลิตภัณฑ์ต่างๆที่อยู่ในห้องครัว เช่น น้ำยาล้างจาน น้ำปลา ซอส หรือเครื่องปรุงอื่นๆ		
3. มีที่เก็บสารเคมีทางการเกษตรได้อย่างเหมาะสม เช่น ตู้หรือห้องเก็บเฉพาะที่พ้นจากมือเด็ก		
4. ที่เก็บสารเคมีทางการเกษตรมีกุญแจล็อคที่ปลอดภัย		
5. เก็บสารเคมีทางการเกษตรในเก็บในตู้หรือห้องเก็บเฉพาะที่พ้นจากมือเด็ก		
6. เก็บสารเคมีทางการเกษตรในเก็บในตู้หรือห้องเก็บเฉพาะที่มีกุญแจล็อคที่ปลอดภัย		
7. วางเสื้อผ้าที่ใช้ในการพ่นสารเคมีทางการเกษตรหรือหว่านปุ๋ยไว้รวมกับเสื้อผ้าทั่วไป		
8. แยกซักเสื้อผ้าที่ใช้ในการพ่นสารเคมีทางการเกษตรออกกับเสื้อผ้าทั่วไป		
9. มีบริเวณหรือพื้นที่เฉพาะที่ใช้กำจัดสารเคมีทางการเกษตรที่เหมาะสม เช่นมีถังขยะอันตรายแยกออกจากถังขยะทั่วไป		
10. ทิ้งภาชนะบรรจุสารเคมีทาการเกษตรในถังขยะทั่วไป		
11. มีเบอร์โทรศัพท์ของโรงพยาบาล สถานีอนามัย ศูนย์พิษวิทยา เพื่อโทรในกรณีที่มีเหตุฉุกเฉินที่เกิดขึ้นเนื่องมาจากพิษจากการใช้สารเคมีทางการเกษตร		
12. เบอร์โทรฉุกเฉินวางไว้ในที่ที่ง่ายต่อการโทร เช่น วางไว้ในจุดที่ใช้ได้สะดวกเวลามีเหตุฉุกเฉิน		

(Modified from Susan C.et al.)

ข้อสังเกตเพิ่มเติม

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ส่วนที่ 6 แบบประเมินการมีส่วนร่วมของชุมชน

คำชี้แจง กรุณาทำเครื่องหมาย ✓ ในช่อง "ใช่" หรือ "ไม่ใช่" ตามความเป็นจริงและจากที่ท่านสังเกตเห็น

ข้อคำถาม	ระดับคะแนน				
	1 น้อยมาก	2 น้อย	3 ปานกลาง	4 มาก	5 มากที่สุด
1. ปัจจัยด้านความต้องการของชุมชน					
1.1 การใช้สารเคมีทางการเกษตรอย่างไม่ปลอดภัยเป็นปัญหาที่สำคัญในชุมชนของท่านที่ต้องเร่งแก้ไข					
1.2 การได้รับข้อมูลเรื่องการใช้สารเคมีทางการเกษตรอย่างปลอดภัยมีประโยชน์ต่อชุมชนของท่าน					
1.3 ชุมชนของท่านนำข้อมูลเรื่องการใช้สารเคมีทางการเกษตรที่ปลอดภัยเข้าเป็นแผนพัฒนาชุมชน					
2. ปัจจัยด้านผู้นำชุมชน					
2.1 การรณรงค์เรื่องการใช้สารเคมีทางการเกษตรที่ปลอดภัย ได้รับความร่วมมือจาก ผู้นำชุมชน เช่น กำนัน ผู้ใหญ่บ้าน หรือผู้ช่วยผู้ใหญ่บ้าน เป็นอย่างดี					
2.2 ผู้นำชุมชนมีส่วนร่วมในการตัดสินใจในการปรับเปลี่ยนแผนงาน เพื่อให้เกษตรกรมีความปลอดภัยจากการใช้สารเคมีทางการเกษตรมากขึ้น					
3. ปัจจัยด้านการใช้ทรัพยากร					
3.1 ท่านมีส่วนร่วมในการจัดสรรและกระจายทรัพยากร (เงิน, บุคคล, วัตถุ) เพื่อให้คนในชุมชนของท่านมีพฤติกรรมการใช้สารเคมีทางการเกษตรให้ปลอดภัย					
4. ปัจจัยที่เกี่ยวข้ององค์กรท้องถิ่น					
4.1 องค์กรท้องถิ่นในชุมชนของท่านมีส่วนร่วมทำให้ชาวนาใช้สารเคมีทางการเกษตรได้ปลอดภัยมากขึ้น					
4.2 กลุ่มเกษตรกรมีบทบาทในตัดสินใจและแสดงความคิดเห็นในเวทีชุมชน					
5. ปัจจัยด้านการบริหารจัดการ					
5.1 การบริหารจัดการในชุมชนมีผลทำให้เกษตรกรมีพฤติกรรมการใช้สารเคมีทางการเกษตรได้ปลอดภัยขึ้น					

(Modified from Rifkin SB, et al, 1988 and Gunilla Bjaras, 1991)

Appendix I

Booklet's content

ใช้สารเคมีกำจัดศัตรูพืชอย่างไร..ให้ปลอดภัย

คู่มือสำหรับเกษตรกรและประชาชนทั่วไป

วิทยาลัยวิทยาศาสตร์สาธารณสุข
จุฬาลงกรณ์มหาวิทยาลัย
COLLEGE OF PUBLIC HEALTH SCIENCES
CHULALONGKORN UNIVERSITY

RUTGERS
THE STATE UNIVERSITY
OF NEW JERSEY

บุบผา รักษานาม
สุรศักดิ์ ฐานีพานิชสกุล
วัฒน์สิทธิ์ ศิริวงศ์

ใช้สารเคมีกำจัดศัตรูพืชอย่างไร..ให้ปลอดภัย

คู่มือสำหรับเกษตรกรและประชาชนทั่วไป

ใช้สารเคมีกำจัดศัตรูพืชอย่างไรให้ปลอดภัย

คู่มือสำหรับเกษตรกรและประชาชนทั่วไป

ผู้แต่ง: 1) อ.ภญ.บุบผา รักษานาม

วิทยาลัยการสาธารณสุขสิรินธร จังหวัดตรัง

2) ศ.นพ.สุรศักดิ์ ฐานีพานิชสกุล

วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

3) ผศ.ดร.วัฒน์สิทธิ์ ศิริวงศ์

วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

ที่ปรึกษา: ศ.ดร.มาร์ค เกเกรอรี่ ร็อบสัน (Prof.Dr.Mark G.Ronson)

School of Environmental and Biological Sciences,

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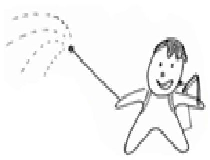
พิมพ์ครั้งที่ 1: เมษายน 2555 **จำนวน**: 100 เล่ม

สำนักพิมพ์: บริษัท แดเน็กซ์ อินเตอร์คอร์ปอเรชั่น จำกัด

100/470 ถ.เสนานิคม แขวงลาดพร้าว

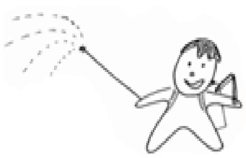


คำนำ

คู่มือนี้จัดทำขึ้นเพื่อให้ผู้อ่านได้ตระหนักถึงความสำคัญ อันตรายของสารเคมีกำจัดศัตรูพืชรวมถึงแนวทางในการปฏิบัติตนเพื่อให้ปลอดภัยจากการใช้สารเคมีกำจัดสัตรูพืช เนื้อหาไม่ซับซ้อนอ่านเข้าใจง่าย ผู้เขียนได้รวบรวมแนวคิดและแนวทางที่ปฏิบัติได้จริงซึ่งได้จากแหล่งข้อมูลในปัจจุบัน ผนวกกับกระบวนการเรียนรู้แบบมีส่วนร่วมของเกษตรกรในชุมชนตำบลคลองเจ็ด อำเภอคลองหลวง จังหวัดปทุมธานี ผู้เขียนหวังว่าคู่มือฉบับนี้คงเป็นประโยชน์ต่อเ กษตรกรและผู้ที่สนใจทั่วไป หากมีข้อผิดพลาดประการใด ผู้เขียนขออภัยมา ณ โอกาสนี้ และผู้เขียนยินดีรับข้อเสนอแนะเพื่อนำไปพัฒนางานให้ดียิ่งขึ้น

บุบผา รักษานาม และคณะ

เมษายน 2555



สารบัญ

มารู้จักกับสารเคมีกำจัดศัตรูพืชกันดีกว่า

สารเคมีกำจัดศัตรูพืช (Pesticide) คือสารที่ใช้ควบคุม ทำลาย หรือจำกัดศัตรูสัตว์พืช ซึ่งได้แก่ ยาฆ่าไร ยาฆ่าแมลงต่าง ๆ ยาฆ่าไส้เดือนฝอย ยารมควัน ยาปราบวัชพืช ยาทำให้ใบไม้ร่วง และแห้งตาย ยาฆ่าหอยทาก ยาฆ่าเชื้อรา ยาฆ่าสัตว์ที่ใช้ฟันแทะ เป็นต้น สารเคมีกำจัดศัตรูพืช แบ่งออกได้เป็น 4 กลุ่ม ดังนี้

1. กลุ่มออร์กาโนฟอสเฟต

สารกลุ่มนี้นับเป็นยาปราบศัตรูพืชที่ใช้กันมากในปัจจุบัน ได้แก่ โมโนโครโตรฟอ, เมวินฟอส, คลอร์ไพริฟอส, ไดเมทโธเอต, ไดโครโตรฟอส, พาราไธออนเมทธิล และ พาราไธออน

รูปที่ 1 แสดงตัวอย่างของสารเคมีกำจัดศัตรูพืชกลุ่มออร์กาโนฟอสเฟต

2. กลุ่มคาร์บาเมต

ได้แก่ เมทโธมิล, คาร์โบฟูราน, คาร์บาริล, เมทธิโอคาร์บ สารกลุ่มคาร์บาเมตโดยทั่วไปมีการตกค้างสั้น และสลายตัวได้อย่างรวดเร็ว

รูปที่ 2 แสดงตัวอย่างของสารเคมีกำจัดศัตรูพืชกลุ่มคาร์บาเมต

3. กลุ่มออร์กาโนคลอรีน

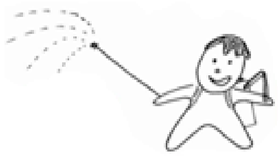
ปัจจุบันกลุ่มนี้ห้ามใช้ในประเทศไทย แต่พบ ว่ายังมีเกษตรกร บางกลุ่มใช้อยู่บ้าง สารกลุ่มออร์กาโนคลอรีนมีความคงทน ไม่สลายตัว ไม่ละลายน้ำ แต่ละลายได้ในน้ำมัน สลายตัวช้า สะสมอยู่ตามดิน ตามแหล่งน้ำอาจเข้าไปสะสมอยู่ในพืชผักผลไม้ได้ เช่น ดีดีที,ไดโคฟอล, ออลดริน เฮปตาคลอร์, คลอร์เดน, บี เอช ซี, ลินเดน

รูปที่ 3 แสดงตัวอย่างของสารเคมีกำจัดศัตรูพืชกลุ่มออร์กาโนคลอรีน

4. กลุ่มไพรีทรัมและกลุ่มอื่น ๆ

ได้แก่ ไซเปอร์เมธริน, เดลตาเมธริน, เฟนวาเลอเรต, และเปอร์เมธริน

รูปที่ 4 แสดงตัวอย่างของสารเคมีกำจัดศัตรูพืชกลุ่มไพรีทรัมและกลุ่มอื่น ๆ



อันตรายของสารเคมีกำจัดศัตรูพืช

กลุ่มออร์กาโนคลอรีน

เมื่อเข้าสู่ร่างกายแล้วจะไปสะสมอยู่ในไขมันตามส่วนต่าง ๆ ในร่างกาย ผู้ป่วยจะแสดงอาการผิดปกติต่อระบบทางเดินอาหาร เบื่ออาหาร คลื่นไส้ อาเจียน น้ำหนักลด เหน็ดเหนื่อยและเมื่อยล้า นอกจากนี้ยังพบว่าฤทธิ์ที่ร้ายแรงของดีดีทีสะสมระยะยาว ทำให้เกิด มะเร็งตับ มะเร็งเม็ดเลือดขาว และทำให้เกิดโลหิตพิษต่อระบบประสาททำให้เกิด กระวนกระวาย เวียนศีรษะ เสียการทรงตัว อาจพบอาการ หลงลืม เกร็ง ชักกระตุก และหมดสติเนื่องจากเกิดการกดการหายใจ

กลุ่มออร์กาโนฟอสเฟต

อาการพิษเฉียบพลันที่พบได้แก่ มึนศรีษะ ปวดศรีษะ มึนงง ซึม กระสับกระส่าย ชักหมดสติได้ ผู้ป่วยที่มีอาจตายได้ เนื่องจากกระบวนการหายใจล้มเหลว ส่วนอาการพิษระยะยาว อาจก่อให้เกิดพิษ ต่อระบบประสาท ซึ่งเกิดขึ้นหลังจากช่วงเวลาหนึ่ง โดยเริ่มเกิดขึ้นที่ส่วนปลายประสาท เดินโซเซ เสียความรู้สึก กล้ามเนื้ออ่อนเพลีย ต่อมาความรุนแรง และอ่อนเพลียมากขึ้น

กลุ่มคาร์บาเมต

มีผลต่อระบบประสาทคล้ายกับกลุ่มออร์กาโนฟอสเฟต ออกฤทธิ์ในระยะสั้น และสลายตัวรวดเร็ว จึงมีฤทธิ์อ่อน พิษที่เกิดขึ้นจึงไม่รุนแรง

กลุ่มไพรีทรอยด์

สารกำจัดแมลงกลุ่มไพรีทรอยด์ มีกลไกออกฤทธิ์ เช่นเดียวกับสารพวกออร์กาโนคลอรีน แต่ฤทธิ์น้อยกว่า นิยมใช้เพื่อกำจัดแมลงในบ้านเพราะออกฤทธิ์ให้เกิดอัมพาตในแมลงอย่างรวดเร็ว โดยส่วนใหญ่แล้ว มีพิษต่อสัตว์เลี้ยงลูกด้วยนม ไม่มากนัก อาจทำให้คลื่นไส้ อาเจียน เป็นตะคริว เบื่ออาหาร อ่อนเพลีย ปวดศีรษะ มึนงง การรับประทานสารนี้ในปริมาณสูง ทำให้เกิดอาการหมดสติ ชักและกล้ามเนื้อกระตุก

รูปที่ 5 แสดงตัวอย่าง ชาวนาเกิดอาการพิษเฉียบพลัน เป็นลมหมดสติ กล้ามเนื้ออ่อนแรง เนื่องจากได้รับพิษจากสารเคมีกำจัดศัตรูพืชกลุ่มออร์กาโนฟอสเฟต

รูปที่ 6 แสดงตัวอย่าง อาการพิษในระยะยาวของเด็กที่พิการมาตั้งแต่กำเนิดเป็นผลมาจากแม่ได้รับยาฆ่าหญ้าในขณะตั้งครรภ์ เด็กคนนี้มีชีวิตอยู่ได้ไม่นานก็เสียชีวิต (ข้อมูลจาก http://www.organicconsumers.org/epa7.htm)

กล่าวโดยสรุป ส่วนใหญ่อาการเป็นพิษ จากสารเคมีกำจัดศัตรูพืชจะมีผล ต่อระบบประสาทของสิ่งมีชีวิต อาการที่เกิดอาจเป็นชนิดรุนแรงหรือชนิดเรื้อรังก็ได้ทั้งนี้ขึ้นอยู่กับ ชนิดและปริมาณของสารเคมีกำจัดศัตรูพืช ปริมาณสารตกค้างที่สะสมอยู่ในร่างกาย

สารเคมีกำจัดศัตรูพืชเข้าสู่ร่างกายได้อย่างไร

สารเคมีกำจัดศัตรูพืชสามารถเข้าสู่ร่างกายได้ 3 ทางหลัก ๆ ดังต่อไปนี้

1. ผิวหนัง(บ่อยสุด)

2. ปาก

3.ลมหายใจ

ตัวอย่างชุดอุปกรณ์ป้องกันตนเอง

ชุดอุปกรณ์ป้องกันตนเองให้ปลอดภัยจากการใช้สารเคมีกำจัดศัตรูพืช ประกอบด้วย

1. หมวก
2. แว่นตา
3. ที่ปิดจมูกและปาก
4. เสื้อแขนยาว
5. กางเกงขายาว
6. ถุงมือยาง
7. รองเท้าบู๊ต

รูปที่ 7 แสดงตัวอย่างชุดอุปกรณ์ป้องกันตนเอง

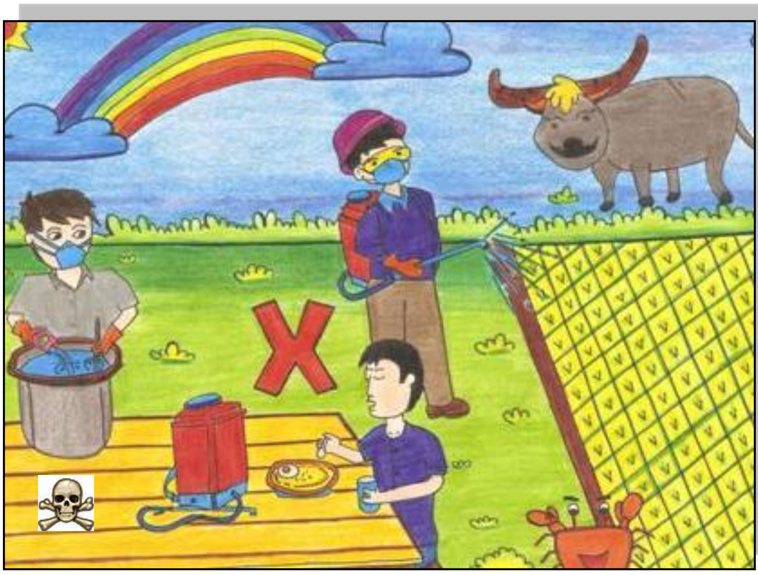
==มารู้วิธีใช้สารเคมีศัตรูพืชให้ปลอดภัยกันดีกว่า==

1. อ่านฉลากให้เข้าใจก่อนใช้และปฏิบัติตามคำแนะนำ

2.ไม่ใช้มือเปล่าผสมสารเคมีกำจัดศัตรูพืช ควรใช้อุปกรณ์ช่วยผสม

3. ขณะฉีดพ่นสารเคมีกำจัดศัตรูพืช ควรแต่งตัวให้มิดชิด

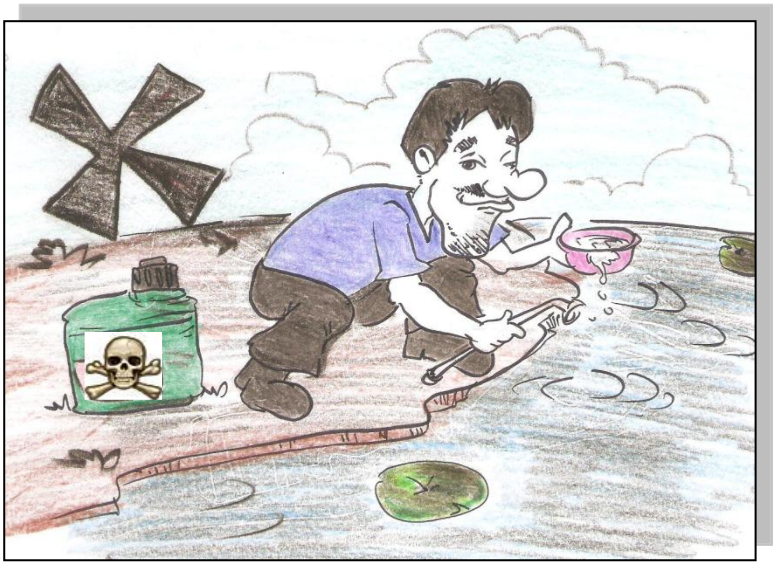
2. ไม่ควรฉีดพ่นสารเคมีกำจัดศัตรูพืชขณะลมแรง และควรอยู่เหนือลม



5. ไม่รับประทานอาหารในบริเวณที่ผสมหรือฉีดพ่นสารเคมีกำจัดศัตรูพืช

6. ไม่ใช้ปากดูดหรือเป่าเมื่อท่อตัน

7. ไม่สูบบุหรี่ขณะปฏิบัติงาน



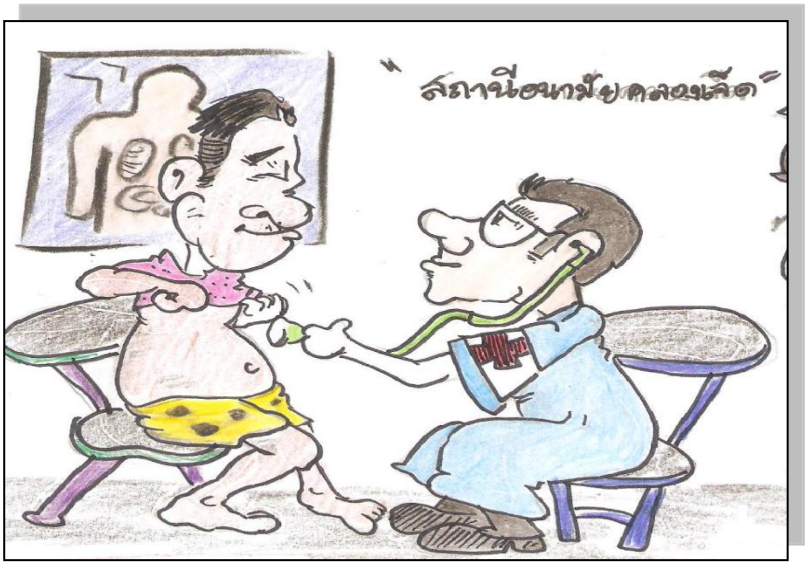
8. ไม่ล้างอุปกรณ์ฉีดพ่นฯลงในแม่น้ำลำคลอง

9. ฝังกลบภาชนะบรรจุสารเคมีกำจัดศัตรูพืชที่ใช้แล้ว

10. ทำป้ายเตือนบริเวณที่เพิ่งฉีดสารเคมีกำจัดศัตรูพืช

11. แยกซักชุดที่ใช้ฉีดพ่นสารเคมีกำจัดศัตรูพืชและอาบน้ำทันทีหลังจากเสร็จงาน

12. เก็บสารเคมีกำจัดศัตรูพืชในที่ปลอดภัยและให้พ้นมือเด็ก



13. หมั่นไปตรวจสุขภาพเป็นประจำ

มารู้จักฉลากสารเคมีกำจัดศัตรูกันดีกว่า

ข้อความในฉลากประกอบด้วย

1. ชื่อการค้า
2. ชื่อสามัญ
3. อัตราส่วนผสมและลักษณะผลิตภัณฑ์
4. วัตถุประสงค์การใช้
5. เครื่องหมาย แสดงคำเตือนในการใช้
6. ประโยชน์วิธีใช้วิธีเก็บรักษา
7. คำเตือน
8. อาการเกิดพิษ การแก้พิษเบื้องต้น
9. ชื่อผู้ผลิต สถานที่ประกอบการ
10. ขนาดบรรจุ
11. วัน เดือน ปีที่ผลิต หรือวันหมดอายุ
12. เลขทะเบียนวัตถุอันตราย

รูปตัวอย่างข้อความในฉลาก

- ชื่อการค้า: แอ๊ดบา
- ชื่อสามัญ: อะบาเม็กติน
- ส่วนประกอบ: อะบาเม็กติน 1.8% w/v E
- ใช้เพื่อกำจัดแมลง
- เลขทะเบียนวัตถุอันตราย: เลขที่ 84-2552
- ผลิตโดยบริษัทเกษตรผ่าโลกเคมีคอล กำจัด

เครื่องหมายและข้อความอยู่ในแถบสี

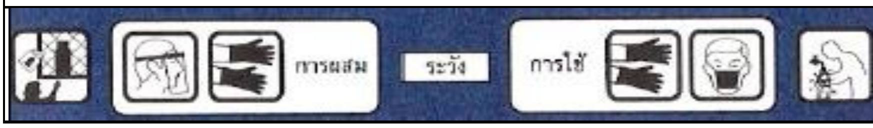
ตามประกาศกระทรวงเกษตรและสหกรณ์เรื่องฉลากและระดับความเป็นพิษของวัตถุอันตราย ได้แบ่งระดับความเป็นพิษออกเป็น 4 ชั้น โดยใช้แถบสีเป็นสิ่งกำหนดดังนี้

ชั้น 1 เอ หมายถึง วัตถุอันตรายทางการเกษตรที่มีพิษร้ายแรงมาก

ชั้น 1 บี หมายถึง วัตถุอันตรายทางการเกษตรที่มีพิษร้ายแรง

ชั้น 2 หมายถึง วัตถุอันตรายทางการเกษตรที่มีพิษปานกลาง

ชั้น 3 หมายถึง วัตถุอันตรายทางการเกษตรที่มีพิษน้อย

	(สีแดง)
	(สีเหลือง)
	(สีน้ำเงิน)

อธิบายสัญลักษณ์

เก็บในที่มิดชิดใส่กุญแจและพ้นจากมือเด็ก

ทำความสะอาดร่างกายหลังฉีดพ่น

สวมถุงมือ

สวมหน้ากากป้องกันแก๊ส

สวมที่กันบังหน้า

สวมชุดป้องกัน

สวมรองเท้าบู๊ต

สวมหน้ากากปิดจมูกและปาก

เมื่อได้รับพิษจากสารเคมีกำจัดศัตรูพืชจะทำอย่างไร

1. ถ้าสารเคมีกำจัดศัตรูพืชเปื้อนเสื้อผ้า ให้ถอดออกและอาบน้ำให้สะอาดทันที
2. หากสารเคมีกำจัดศัตรูพืชสัมผัสร่างกายให้ล้างด้วยสบู่และน้ำทันที
3. หากสารเคมีกำจัดศัตรูพืชเข้าตา ให้ล้างด้วยน้ำสะอาดหลาย ๆ ครั้งติดต่อกันเป็นเวลาอย่างน้อย 10 นาที และไปพบจักษุแพทย์ทันที
4. หากสารเคมีกำจัดศัตรูพืชเข้าปาก ไม่ควรกระตุ้นให้อาเจียน ยกเว้น ในฉลากระบุว่า รีบทำให้อาเจียน ต้องปฏิบัติตามคำแนะนำในฉลากและรีบไปสถานีอนามัย หรือโรงพยาบาลใกล้ที่สุดพร้อมทั้งนำภาชนะและฉลากไปด้วย

เมื่อเกิดอาการแพ้ในขณะใช้สารเคมีกำจัดศัตรูพืชจะทำอย่างไร

1. หยุดใช้ทันที
2. ให้อยู่ในที่ที่มีอากาศถ่ายเทได้สะดวก
3. ควรงดสูบบุหรี่ ดื่มสุรา หรือดื่มนมเพราะอาจทำให้เกิดอาการรุนแรงยิ่งขึ้น
4. ถ้ายังมีอาการแพ้อยู่ ควรเลิกทำงาน และอาบน้ำเปลี่ยนเสื้อผ้าทันที
5. หากอาการแพ้ยังไม่หาย ควรรีบไปสถานีอนามัย หรือโรงพยาบาลที่ใกล้ที่สุด พร้อมทั้งนำภาชนะบรรจุและฉลากของสารเคมีกำจัดศัตรูพืชที่ใช้ไปด้วย

การปฐมพยาบาลผู้ป่วยที่ได้รับพิษจากสารเคมีกำจัดศัตรูพืช

1. นำผู้ป่วยออกจากบริเวณที่มีการใช้สารเคมีกำจัดศัตรูพืช และให้อยู่ในที่ที่อากาศถ่ายเทได้ดี
2. ดูว่าสารเคมีกำจัดศัตรูเปื้อนเสื้อผ้าหรือร่างกายผู้ป่วยหรือไม่ หากพบให้ถอดเสื้อผ้าออกและล้างร่างกายบริเวณที่เปื้อนให้สะอาดด้วยสบู่และน้ำ
3. หากผู้ป่วยไม่รู้สึกตัว ให้จับนอนตะแคง และเชยคางขึ้นเพื่อหายใจได้สะดวก
4. ถ้าผู้ป่วยได้รับสารเคมีกำจัดศัตรูพืชทางปาก ไม่ควรทำให้อาเจียน ยกเว้น ในฉลากระบุว่ารีบทำให้อาเจียนต้องปฏิบัติตามคำแนะนำในฉลาก
5. รีบนำผู้ป่วยไปพบแพทย์ทันที พร้อมทั้งนำภาชนะบรรจุและฉลากของสารเคมีกำจัดศัตรูพืชที่เป็นสาเหตุไปด้วย

มาสำรวจที่บ้านของคุณกันดีกว่า...ว่า...
วันนี้คุณปลอดภัยจากใช้สารเคมีกำจัดศัตรูพืชแล้วหรือยัง

1.วางสารเคมีกำจัดศัตรูพืชปนกับผลิตภัณฑ์ต่าง ๆ ที่อยู่ในห้องน้ำ เช่น ครีมอาบน้ำ น้ำยาบ้วนปาก ผงซักฟอก เป็นต้น

❒ ใช่

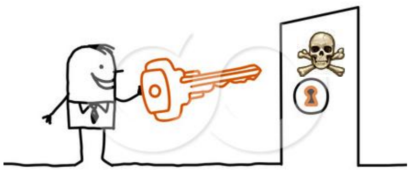
❒ ไม่ใช่

2. วางสารเคมีกำจัดศัตรูพืชปนกับผลิตภัณฑ์ต่าง ๆที่อยู่ในห้องครัว เช่น น้ำยาล้างจาน น้ำปลา ซอส หรือเครื่องปรุงอื่น ๆ

❒ ใช่

❒ ไม่ใช่

3. มีที่เก็บสารเคมีกำจัดศัตรูพืชได้อย่างเหมาะสม เช่น ตู้หรือห้องเก็บเฉพาะที่ปลอดภัย



❒ ใช่

❒ ไม่ใช่

4. ที่เก็บสารเคมีกำจัดศัตรูพืชมีกุญแจล็อคที่ปลอดภัย

❐ ใช่

❐ ไม่ใช่

5. เก็บสารเคมีกำจัดศัตรูพืชในที่เก็บเฉพาะที่และพ้นจากมือเด็ก

❐ ใช่

❐ ไม่ใช่

6. แยกเก็บเสื้อผ้าที่ใช้ในการพ่นสารเคมีกำจัดศัตรูพืชออกจากเสื้อผ้าทั่วไป

❐ ใช่

❐ ไม่ใช่

7. แยกซักเสื้อผ้าที่ใช้ในการพ่นสารเคมีกำจัดศัตรูพืชออกจากเสื้อผ้าทั่วไป

❐ ใช่

❐ ไม่ใช่

8. มีบริเวณหรือพื้นที่เฉพาะที่ใช้กำจัดสารเคมีจำกัดศัตรูพืชหรือปุ๋ยเคมีอย่างเหมาะสม เช่นมีถังขยะแยกกับขยะทั่วไป

❐ ใช่

❐ ไม่ใช่

9. ทิ้งภาชนะบรรจุสารเคมีจำกัดศัตรูพืชในถังขยะอันตราย

- ❒ ใช่
- ❒ ไม่ใช่

10. มีเบอร์โทรศัพท์ของโรงพยาบาล สถานีอนามัย หรือศูนย์พิษวิทยา วางอยู่ในบริเวณที่หาง่าย เพื่อโทรในกรณีที่มีเหตุฉุกเฉินที่เกิดขึ้นเนื่องมาจากพิษจากสารเคมีกำจัดศัตรูพืช

- ❒ ใช่
- ❒ ไม่ใช่

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ขอขอบคุณ

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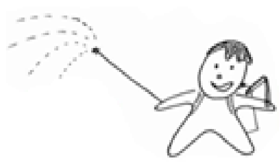
2. วิทยาลัยการสาธารณสุขสิรินธร จังหวัดตรัง
3. สถาบันพระบรมราชชนก กระทรวงสาธารณสุข
4. สำนักงานคณะกรรมการข้าราชการพล*เรือน (ก.พ.*)
5. บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย
6. The Thai Fogarty ITREOH Center (D43TW007849 NIH FIC)
7. School of Environmental and Biological Sciences, Rutgers University ประเทศสหรัฐอเมริกา
8. School of Public Health, University of Medicine and Dentistry of New Jersey ประเทศสหรัฐอเมริกา
9. โรงพยาบาลส่งเสริมสุขภาพตำบล คลองเจ็ด อำเภอคลองหลวง จังหวัดปทุมธานี
10. องค์การบริหารส่วนตำบลคลองเจ็ด อำเภอคลองหลวง จังหวัด ปทุมธานี
11. ประชาชนในตำบลคลองเจ็ด อำเภอคลองหลวง จังหวัดปทุมธานี ที่ ให้ความร่วมมือและอนุเคราะห์ในการดำเนินงานวิจัย



Appendix J

Video script of Case Study: Agrochemical Risk Behaviors

in Khlong Seven Community

กรณีศึกษา: พฤติกรรมใช้สารเคมีกำจัดศัตรูพืชที่ไม่ปลอดภัย “เหตุเกิด ณ คลองเจ็ด”

ณ ตำบลคลองเจ็ด รังสิต จ .ปทุมธานี ในฤดูฝนมีการเตรียมปักดำกล้าข้าวทุกครอบครัวจะออกไปไถนาเตรียมการเพาะปลูก ครอบครัวของชายหนุ่มคนหนึ่งชื่อว่าทอง มีแม่แก่ๆคนหนึ่ง ทองกำพร้าพ่อมาตั้งแต่ยังเป็นเด็กตัวเล็กๆ ทองเป็นคนขยันขันแข็ง ทุกๆวันทองจะออกไปทำนาและรับจ้างฉีดยาฆ่าแมลงและรับจ้างพ่นปุ๋ยเคมี แม่ก็มีหน้าที่เตรียมข้าวปลาอาหารไปส่งให้ทองที่ท้องนา ทั้งสองอยู่กันอย่างมีความสุข

แม่: ไอ้ทอง.... มาทานข้าวเร็วลูก

ทอง: จ้าแม่...แล้วแม่มีอะไรให้ฉันกินบ้างล่ะ

แม่: เยอะแยะเลยลูก...มีแต่ของโปรดของแกทั้งนั้นเลยลูก…
แต่...เดี๋ยวๆนั่นเพิ่งมาจากทุ่งนาใช่ไหม...

ทอง: ใช่แม่...

แม่: งั้นไปล้างไม้ล้างมือให้เรียบก่อนนะ เพิ่งไปใส่ปุ๋ยเคมีและพ่นยาฆ่าแมลงมาไม่ใช่เหรอ

ทอง: ฉันว่าล้างมืออย่างเดียวคงไม่พอหรอกแม่เดี๋ยวฉันอาบน้ำเลยดีกว่า

ทอง: แม่...แม่ยังไม่เคยเล่าให้ฉันฟังเลยนะว่าพ่อทำไมถึงตาย

แม่: พ่อแกเป็นคนขยันขันแข็ง อยู่มาวันหนึ่ง ผู้ใหญ่บ้านจ้างไปพ่นยาฆ่าแมลง วันนั้นพ่อแกไม่ค่อยสบาย แต่เพราะรับปากพ่อผู้ใหญ่เขาไว้แล้วว่าจะไปช่วยก็เลยต้องไป วันนั้นลมแรงมาก งานก็เร่ง คนก็ไม่สบาย พ่อแก ล้มกลางทุ่ง พาไปสถานีอนามัยแล้วหมอที่อนามัยบอกว่าช่วยไม่ทัน พ่อเองก็เลยจากไปพวกเราไป

…………………………………………..

เช้าวันหนึ่งทองต้องรีบไปรับจ้างใส่ปุ๋ยเคมีและพ่นยาฆ่าแมลงในนาข้าว

ทอง: แม่ ฉันไปรับจ้างใส่ปุ๋ยเคมีและฉีดยาฯ ก่อนนะ เดี๋ยวจะสาย วันนี้ตาทิมเขานัดไว้ตอน 6 โมงเช้าน่ะ จะได้ไม่มีลมไม่มีแดด

แม่: เออ! ไปเถอะลูก เดี๋ยวสายๆ แม่จะเอาข้าวไปให้กินนะลูก...รออยู่ที่นานั่นแหละ

ทอง: จ้า...แม่...เดี๋ยวฉันจะรอนะ

เช้าวันนั้นกำนันประจำตำบลคลอง 7 ประกาศนัดประชุมลูกบ้านเรื่องรณรงค์การใช้สารเคมีทางการเกษตรให้ปลอดภัย แม่ของทองก็เข้าไปร่วมฟังด้วย

กำนัน: สวัสดีครับพ่อแม่พี่น้องชาวตำบลคลองเจ็ดที่เคารพรักทุกท่าน เมื่อวานผมได้ไปประชุมที่อำเภอ ทางอำเภอให้ข้อมูลมาว่าข้อมูลที่รายงานจากกระทรวงสาธารณสุขพบว่า ปีนี้ชาวนาได้มีอัตราการเจ็บป่วยเนื่องมาจากการใช้สารเคมีทางการเกษตรเพิ่มขึ้นเยอะรวมทั้งตำบลของเราด้วย ดังนั้นรัฐบาลมีนโยบายให้แต่ละตำบลรณรงค์การใช้สารเคมีทางการเกษตรให้น้อยลงและใช้อย่างปลอดภัย

ลูกบ้าน: แล้วไอ้อาการเจ็บป่วยที่ว่านี้มีอะไรล่ะพ่อกำนัน

กำนัน: ถ้าอย่างนั้นเราไปถามคุณหมอเลยกว่า....

หมออนามัย: อาการที่ว่านั้นก็สามารถพบได้หลายอย่างครับ ตัวอย่างเช่น สับสน มึนงง วิงเวียน เป็นลม ปวดศีรษะ อ่อนแรง เหงื่อออกมากสั่น บางคนอาจมีอาการ คลื่นไส้ อาเจียน ขมปาก น้ำลายเยอะกว่าปกติ ปวดท้อง ท้องเดิน ไอ จาม แน่นหน้าอก หายใจลำบาก ระคายเคือง คอ จมูก ระคายเคืองตา ตาพร่ามัว ผื่นคัน แดง

หมออนามัย: เดี๋ยวผมจะให้ดูตัวอย่างกรณีศึกษานี้นะครับ (วิดีโอตัวอย่างกรณีศึกษา)

กำนัน: ทีนี้เข้าใจหรือยังครับพี่น้อง...ว่ามันอันตรายแค่ไหน

ลูกบ้าน: อ๋อ....มันเป็นอย่างนี้นี่เอง... แสดงว่าที่ผ่านมาพวกเราเข้าใจกันผิดมาโดยตลอดนะเนี่ย...นึกว่ามันไม่อันตราย

กำนัน: อย่าลืมไปเล่าสู่กันฟังล่ะ ไปบอกต่อกันเยอะๆนะ

แม่: เสียดายเนอะไอ้ทองไม่ได้มาฟังด้วย เดี๋ยวไปเล่าให้มันฟังต่อดีกว่า แล้ว มันจะเชื่อเราหรือเปล่าเนี่ย ....เอ้อ....ตายแล้วลืมไปเลยว่าไอ้ทองมันรอทานข้าวนี่หว่า....ป่านนี้คงจะชะเง้อดูแล้วแน่ ไอ้ทองคงจะหิวข้าวแล้วแน่เลย....รอแม่ก่อนนะลูก

ตะวันขึ้นสูงแล้วรู้สึกเหน็ดเหนื่อยอ่อนเพลียมากกว่าปกติ และหิวข้าวมากกว่าทุกวัน ปกติแล้วแม่ผู้ชราจะมาส่งก่องข้าวให้ทุกวัน แต่วันนี้กลับมาช้าผิดปกติ

ทอง : เฮ้อ! ป่านนี้ทำไมแม่ยังไม่มาอีกน๊า แม่จะรู้มั๊ยเนี่ยว่าฉันเหนื่อยและหิวแค่ไหน.....หิวๆๆๆๆๆๆๆๆๆๆๆ เฮ้ย....จะเสร็จแล้ว ทำไมลมมันพัดแรงจัง อีกนิดเดียว...

อ้าว..อ้าว...ท่อที่พ่นยาก็มาตันซะอย่างงั้น...ไหนๆก็จะเสร็จแล้ว ฝืนซะหน่อยคงไม่เป็นไรหรอกนะ...ไหน ....ไหน ...มันเสียตรงไหน.... ตรงไหนมันตัน...

ทองใช้ปากเป่าบริเวณที่ท่อพ่นยาฆ่าแมลงตัน....ซักพักก็ล้มหมดสติไป

ระหว่างทางที่แม่เดินถือก่องข้าวไปก็มีชาวนาฉีดพ่นยาฆ่าแมลงกันอย่างเป็นร่ำเป็นสัน ลมก็แรง เหมือนฝนจะตก แม่: ป่านนี้ไอ้ทองจะเป็นไงบ้างน๊า....

แม่: อ้าว...ลูกรักของแม่ เหนื่อยแล้วทำไมไม่เข้ามานอนพักใต้เถียงนา ไปนอนเล่นกลางทุ่งซะอย่างงั้น หรือว่ามันอยากเปลี่ยนบรรยากาศ ....สงสัยจะใช่แฮะ...

ทอง.....ทอง.....ไอ้ทอง.....แม่มาแล้วลูก....เหนื่อยก็เข้ามานอนในร่มสิลูก นอนตรงนั้นมันร้อนนะลูก....ทอง....ไอ้ทอง .....เอ๊ะ....เรียกแล้วมันทำไมไม่กระดิกวะ.......ไอ้ลูกคนนี้...หรือว่ามันงอนแม่...โอ๋ๆๆ อย่างอนแม่เลยลูกแม่

ไอ้ทอง.....ไอ้ทอง....ฮ่า......ช่วยด้วยๆๆๆๆ ไอ้ทองแย่แล้ว.... ช่วยลูกฉันด้วย ไอ้ทองไม่รู้เป็นไร เรียกก็ไม่ตื่น ลุงทิมๆๆ......ช่วยด้วยๆๆๆๆ ช่วยลูกฉันด้วย

ลุงทิม: พามันไปหาหมอที่อนามัยเร็วๆๆๆๆๆ

แล้วลุงทิมก็อุ้มไอ้ทองไปที่สถานีอนามัยคลองเจ็ด

ณ สถานี อนามัยตำบลคลองเจ็ด หมออนามัยกำลังตรวจรักษาคนไข้อยู่...

ป้า: หวัดดีค่ะคุณหมอ พักนี้ป้าไม่รู้เป็นอะไร นอนไม่ค่อยหลับ มันรู้คันตามตัว และหายใจไม่ค่อยสะดวกเลยค่ะ

หมออนามัย: ไหนมาให้หมอฟังเสียงหายใจและดูบริเวณที่ป้าคันป้าซิ....

ป้า: ค่ะคุณหมอ

แม่: คุณหมอๆๆๆ ช่วยลูกฉันด้วยค่ะ........ มันฉีดยาฆ่าแมลงอยู่ดีๆมันก็ล้มหมดสติไปค่ะ

หมออนามัย: ไหนมาให้หมอดูหน่อยสิ....ไปทำไรมาเนี่ย (ปฐมพยาบาลเบื้องต้น)

แม่: ไม่ทราบเหมือนกันค่ะ มันพ่นยาฆ่าแมลงอยู่ดีๆ แล้วก็ล้มลงหมดสติไปเลยค่ะ

หมออนามัย: โหป้า อาการหนักเกินไปครับ ที่สถานีอนามัยเราไม่มีเครื่องมือที่จะช่วยเหลือคนไข้อาการหนักขนาดนี้ รีบพาคนไข้ไปส่งที่โรงพยาบาลในเมืองด่วนดีกว่า หมอคิดว่าคงพอช่วยทัน เดี๋ยวจะส่งต่อไปโรงพยาบาลในเมืองนะครับ

แม่: ขอบพระคุณคุณหมอมากเลยค่ะ

....

ณ โรงพยาบาลอำเภอคลองหลวง ……หมอกำลังเดินออกมาจากห้องฉุกเฉิน

แม่: คุณหมอค่ะ ลูกของฉันเป็นยังไงบ้างค่ะ

หมอ: ถ้าป้าพามาช้ากว่านี้คนไข้อาจจะไม่รอดนะคะ หมอดีใจกับป้าด้วย ลูกชายคุณป้าปลอดภัย

แม่: จำเอาไว้นะไอ้ทอง....การพ่นยาพ่นปุ๋ยเคมีมันเป็นอาชีพของเราก็จริง แต่เราต้องใช้ให้มันปลอดภัยนะ แก รอดตายมาได้โชคดีขนาดไหนแล้ว

ทอง: ป๊ะ....แม่จะพาไปถามผู้รู้...เรื่องทำอย่างไรให้ปลอดภัยจากการใช้สารเคมีทางการเกษตร...ไปดูพร้อมๆกันเลยดีกว่า

------------ สาธิตการใช้อุปกรณ์ป้องกันตนเองที่ปลอดภัย--------------

…………………………………………………………………………………………………

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บทประพันธ์ ทีมตำบลคลองเจ็ด

เครื่องแต่งกาย พเยาว์ ศรีสุข

เรียบเรียง/ตัดต่อ อ.ภญ.บุบผา รักษานาม

กำกับการแสดง อ.ภญ.บุบผา รักษานาม, พเยาว์ ศรีสุข, กำนันวัลลภ ศรีสุข

ตัวละคร ชาวบ้านและผู้นำหมู่บ้านในตำบลคลองเจ็ด

Appendix K

The Examples of agrochemicals in Khlong Seven Community

Chemical Name	Brand Name	Examples
Pyrethoid	A.V.nock35 Depo Kukai 35	
Carbamate	A.V.Carb	
Benzimidazole	J-Ben A.V.dazim	
Glycine	Glyphosate 48 A.V.Up 48 Market One up Round up	
Avermectin	A.V.Mec, Adba, Abamac Abamectin Ibamac	
Organophosphate	Add bomb Chlorpyrifos 40 Dersban 40E	
Esfenvalerate	Propiconazole+ Difenconazole	

VITAE

Name	Buppha Rakasanam
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Place of Birth	Mahasarakham Province, Thailand

Education

2008-2012	Doctor of Philosophy in Public Health, College of Public Health Sciences, Chulalongkorn University, Thailand (6 months as non-matriculated/visiting student at School of Public Health, University of Medicine and Dentistry of New Jersey, USA)
2005-2007	Master of Pharmacy, Prince of Songkla University, Thailand
1998-2003	Bachelor of Pharmacy, Khon khaen University, Thailand

Professional experience

2003-Present	Pharmacist and academic lecturer in Sirindhorn College of Public Health, Trang, Thailand

Presentation experience

August 9-10, 2011	Oral presentation Entitled "Agrochemical Risk Behaviors among Rice Farmers in Rural Community, Pathumthani, Thailand" in the 3th International Conference on Public Health among Great Mekong Sub-Region Countries. Vientiane, Lao PRD
October 18-20, 2011	Oral presentation entitled "Factors Associated with Pesticide Safety Behaviors Among Farmers in Pathumthani, Thailand" in the 43rd Asia Pacific Academic Consortium for Public Health 2011, Seoul, Korea
February 1-2, 2012	Oral presentation Entitled "Model Development for Improving Environmental Health Safety Related to Pesticide Exposure among Rice Farmers in Pathumthani, Thailand" in the 2012 Asia Pacific Conference on Environmental Science and Kuala Lumpur, Malaysia