

PESTICIDE USE, FARMER KNOWLEDGE AND AWARENESS IN THONG PHA PHUM REGION, KANCHANABURI PROVINCE

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ABSTRACT: Western Thong Pha Phum settlement is an agricultural community in Kanchanaburi Province. Cultivation of field crops, rice and horticulture in the region require an extensive use of pesticides to control pests and weeds. These pesticides may contaminate the environment and affect the health of organisms in the area, including humans. The purposes of this research were to determine type and quantity of pesticide used in the area and to assess knowledge, awareness and behavior of the farmers in Thong Pha Phum region. According to the purposive interview of 100 farmers during 2006-2007, 84% of farmers used pesticide in their agricultural activities. The most commonly used herbicides were glyphosate and paraquatdichloride and the most commonly used insecticides were methomyl, chlorpyrifos and parathion methyl. The heaviest use of herbicide occurred in May or beginning of the rainy season when farmers prepared their fields for new crop, and the heaviest use of insecticide occurred in April in order to control the outbreak of aphids. Surveys on knowledge and behavior related to the safe use of pesticides showed that the farmers had sufficient knowledge on general practice for the safe use of pesticide. However, knowledge on how to read the safety symbols on pesticide label, standard first-aid protocol and the awareness on potential exposure during pesticide spraying were still poorly perceived by the farmers.

Keywords: Thong Pha Phum, pesticide use, farmers' knowledge, farmers' awareness

INTRODUCTION: Thailand is known as an agricultural country with more than 53% of the total area being used for agricultural purposes. Agricultural activities such as field crop and rice cultivation, orchard and tree plantation require an extensive use of pesticides to control pests and weeds. These pesticides may contaminate the environment and pose short-term and long-term effect on health of organisms in the surrounding area, including humans.

Western Thong Pha Phum region is the community of villagers origin of "Pgakau" or "Karen" who immigrate from flooded areas caused by the Vajiralongkorn Dam, a hydroelectric dam of the Electricity Generating Authority of Thailand (EGAT). The area consists of mountains with flat plain in between. Forty percent of the plain is being used as agricultural areas and settlements by locals. Agricultural activities in the region include cultivation of field crops (e.g. cassava), rice, orchard and rubber tree plantation¹⁾. Although agriculture is an important activity of Thong Pha Phum

region, risk of pesticide contamination is still difficult to assess due to the lack of information on extent and pattern of pesticide use.

The current study aimed to gather information on type and quantity of pesticide commonly used in the area and to assess knowledge and behavior of the farmers in Thong Pha Phum region, Kanchanaburi Province. The baseline information collected from this study will be used in combination with information on biological response of sentinel animal species to develop sentinel systems for pesticide contamination which could be used for risk assessment of pesticide contamination in ecosystems as well as humans.

MATERIALS AND METHODS: A questionnaire with closed- and open-ended questions was developed to collect data about socio-economic background of farmers; type, quantity and pattern of pesticide use; and knowledge, awareness and behavior of farmers related to pesticide use. The last part of the questionnaire was modified from a questionnaire previously used with

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tangerine farmers in the Pesticide Safe Use Project²⁾.

During 2006-2007, 100 families of farmers in Thong Pha Phum District (50 families from Tambon Lin Tin and 50 families from Tambon Huay Khayeng), Kanchanaburi Province were purposively sampled³⁾ and interviewed as described previously⁴⁾. Briefly, the sample population was farmers who cultivate field crops, vegetable, rice, orchard or rubber tree, who were informed by the local authorities (e.g. head of the village) and willing to join the interview. Photographs of pesticide containers were taken from the local markets and shown to the respondents during the interview in order to verify the type of pesticide used by farmers. Pesticide containers in farmers' house were randomly checked for brand and type of chemicals.

The questionnaires were gathered and the data were compiled and analyzed with Microsoft Excel.

RESULTS:

Socio-Economic Background

The 100 respondents of this survey were males to females in the ratio of 1:1.2 with an average age of 47 years old. Majority of the respondents (89%) were married and 48% were the family leader. Most of them (65%) had primary school degree. Most families (29%) had 4 members and 45% of the families had 2 members working as farmers. The average net income of each family was 1,279 Baht per month. Twenty one percent of the households had more expenses than incomes. Majority of farmers owned their land on an average of 22.7 Rai (3.63 ha) per household. The most commonly grown crops included corn, cassava, horticulture, rubber tree and banana. When being asked to rank the problems in their occupation, the most common order were 1) high cost of fertilizer and pesticide, 2) water scarcity, 3) low produce price, 4) agricultural pests, 5) crop disease, 6) soil degradation, and 7) lack of knowledge on cultivation of crops.

Use of Pesticide

The majority of respondents (84%) used pesticide to control agricultural pests including 74% who used herbicide and 24% who used insecticide. Sixteen

percent of the farmers did not use any pesticide in the cultivating process, but used mixture of biological materials to control pest or practiced organic farming. Twelve percent of the respondents used mixture of biological materials in combination with synthetic pesticide to control pest.

Use of Herbicide

In Thong Pha Phum region, weed is known as a major problem for farmers due to the climate and high diversity of herbaceous plant. The interview revealed that *Mimosa pudica* L. was the most common type of weeds. Most farmers (74%) used herbicide to control weeds and only 2% of the respondents used mowing method. The most commonly used herbicides were glyphosate and paraquatdichloride. The application of herbicide tended to be highest during May to August when the rainy season and the weed spreading begin.

Use of Insecticide

The most commonly mentioned type of insect pest included thrips, aphids and caterpillars. The surveys showed that 25% of respondents used insecticide to control these pests. The insecticide use in the area included methomyl, chlorpyrifos, parathion methyl, abamectin, cypermethrin and endosulfan. The most commonly used insecticide was methomyl which was used mainly in May-June. Furthermore, it was found that some farmers used pesticides that have been banned in Thailand such as parathion methyl and endosulfan.

Annual Quantity of Active Ingredient

Based on information of type and quantity of pesticide used, amount of active ingredient in each year can be calculated using this equation:

$$Q = A \times T \times Ct \times Ca$$

Q = annual quantity of active ingredient

A = number of application times in each year

T = number of tanks used each time

Ct = concentration of pesticide in each tank

Ca = concentration of active ingredient of pesticide as available in the local market

Table 1 shows the annual quantity of active ingredient of pesticides and reveals that glyphosate,

methomyl, parathion methyl and chlorpyrifos were the most heavily used pesticide in Thong Pha Phum region.

Table 1 Annual quantity of active ingredient of pesticides use in Thong Pha Phum region*

Pesticides	Active ingredient (g)
Glyphosate	561,408
Paraquatdichloride	249,090
Methomyl	179,720
Parathion Methyl	71,700
Chlorpyrifos	66,240

*based on 100 families of farmers or 2.8% of the total farmer families in Thong Pha Phum District, Kanchanaburi Province

Data on the pattern of pesticide use revealed that the heaviest use of herbicide and insecticide (methomyl) occurred in May-June and the heaviest use of insecticide (chlorpyrifos and parathion methyl) occurred from the end of rainy season to the beginning of summer (Figure 1).

Knowledge and Perceptions on Pest Control

When being asked about their general practice for controlling weed and insect pests, the majority of respondents (84%) said that they use pesticides because of its efficiency and ease of buying. Other than this, the alternative methods that farmers used to control pest included using mixture of biological materials as controlling agent, removal by human labor such as mowing, using mechanical device such as light

trap and growing plants that are resistant to pest. Interestingly, most of the farmers had no basic knowledge on using predator or parasite as biological control agent.

Knowledge on Pesticide Label Reading

Most of the farmers had basic knowledge on how to read the label for chemical name and instruction of use. They knew that symbol of skull and bones was indicative of poisonous and dangerous material. However, 58% of the respondents did not know other important safety symbols such as “keep away from children” symbol, “do not discard in water resources” symbol and 99% of the respondents did not know the international colored code of pesticide toxicity.

Knowledge and Perceptions on Pesticide Toxicity

Majority of the respondents (99%) knew that pesticide exposure was dangerous, and aware of the fact that pesticide residue may be transferred to the consumers. Moreover, 93% of the farmers knew that pesticide can be absorbed into the body by dermal exposure, 89% knew that it can get into the body by inhalation, 83% knew that it can get into the body by oral route and 82% knew that it can be absorbed through the circulatory system. Most of the respondents (84%) could identify the sign of acute toxicity including dizziness and headache. However, only 61% could identify chronic toxicity e.g. incidence of tumor.

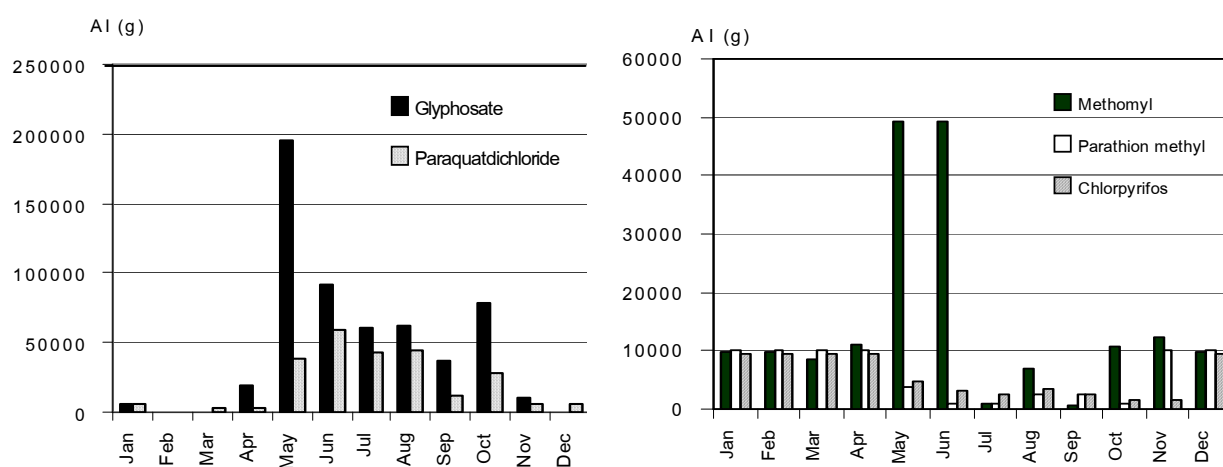


Figure 1 Amount of active ingredient (AI) in pesticide use in each year at Thong Pha Phum region, Kanchanaburi Province [(a) herbicide, (b) insecticide]

Knowledge and Perceptions on Risk of Pesticide Exposure

Forty-five percent of the farmers said that they wear protective clothing and gear (long sleeved shirts, long pants, boots, and mask) while spraying pesticide. However, 55% said they did not wear gloves since it was not convenient. In general, they were aware of practice for safe use including reading and following instruction on label; not spraying against wind direction; hand-washing, showering and washing of clothes after spraying; and proper storage of pesticide containers. However, these were not done on a routine basis.

Interestingly, some of farmers' practices were based on learning from peers with limited or no technical basis. Example of these included drinking soda waters after spraying so that one may belch out the residue; drinking concentrated salty water, lemonade or coconut water after spraying to reduce pesticide toxicity or wearing damp clothes during spraying in order to reduce dermal exposure.

In regard to pesticide container disposal, majority of the respondents (58%) said that they sell the container to the vendor. Other than this, the empty containers were buried (19%), burned and discarded (6%) or discarded in the forest (4%).

Knowledge and Perceptions on Effects of Pesticide on Environment

Every farmer knew that pesticide may affect environmental quality, but only 14% could identify all effects in questionnaire. Majority of them said that pesticide may cause adverse effects on soil, water and air quality as well as on non-target organisms such as fish, birds, cows, buffaloes and aquatic algae.

Knowledge on first-aid protocol

Eighty percent of the farmers did not know how to perform first-aid treatment in case of pesticide poisoning. Most of them said that they will go to health care provider in such an occurrence. Majority of them (40%) chose hospital, followed by local public health center, doctor clinic and local healer. Only 11% of the respondents said that they will buy medicine from

drugstores and 4% will let the symptom subside by itself.

DISCUSSION AND CONCLUSION: This research reports information gathered from a questionnaire survey on pesticide use, knowledge, awareness and behavior of the farmers in agricultural areas of Thong Pha Phum region, Kanchanaburi Province. Based on 100 families of farmers interviewed during 2006-2007, 84% of them used pesticide to control weeds and insects.

The most commonly use herbicides were glyphosate and paraquatdichloride which have been listed by the Department of Agricultural Extension as the 9 popular hazardous substances that may have sub-standard products in market⁵⁾. The heaviest use of herbicides occurred in May or beginning of rainy season when farmers started preparing their fields for cultivation of new crop.

The most commonly use insecticides were methomyl, parathion methyl and chlorpyrifos. Methomyl was the most popular insecticide because of its ability to control aphids⁵⁾, the major insect pest in the area. Aphid outbreaks usually occurred during summer or dry season when rain was low, since heavy rain can limit growth of aphid population⁶⁾. Accordingly, heavy use of methomyl found in this study also occurred during April to June (summer to early rainy seasons). Compared to similar study in Rayong Province, Thailand where durian orchard is the major agricultural activities, cypermethrin was the most commonly used pesticide in the study area due to its ability to control durian tree pest⁴⁾. Parathion methyl, an organophosphate insecticide, is a chemical that had been banned in Thailand since 2004 due to its high toxicity. However, 8% of the respondents still used this chemical since they could get hold of the insecticide before the ban was announced. Similar to methomyl, parathion methyl was used to control aphids during November to April. The use of parathion methyl was minimal during May to October (rainy season). Chlorpyrifos, another organophosphate insecticide, had been used to control aphids

as well as methomyl and parathion methyl⁶⁾. It was found that the farmers who used parathion methyl would use chlorpyrifos as a substitute according to suggestions of pesticide sellers. Chlorpyrifos was used heavily during December to April and rarely used during June to November. It is of interest to note that the amount of insecticide use was minimal during the rainy season since the major pest of this region (aphid) was not spreading during this time.

According to the findings on knowledge, perceptions, awareness and behavior of the farmers, it was found that most had sufficient knowledge on the safe use of pesticide and proper practice to reduce risk of pesticide exposure. The knowledge and awareness of farmers in this region are much better than the Cambodian farmer in Kandal and Siem Riep Provinces who lacked basic knowledge and awareness on the aspect of pesticide poisoning⁷⁾. However, the awareness of risk and consistency of practice of Thong Pha Phum farmers were still lacking. Only 45% of the farmers always wore protective clothing and gears and taking shower after pesticide use. Moreover, surveys on knowledge on pesticide label reading showed that 58% of the respondents did not read nor understand the safety symbol on the label, but rather used pesticide as directed by the sellers.

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การใช้สารกำจัดศัตรูพืช ความรู้และความตระหนักของเกษตรกรในพื้นที่ทองผาภูมิ จังหวัดกาญจนบุรี

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บทคัดย่อ: ชุมชนทองผาภูมิตะวันตกเป็นชุมชนเกษตรกรรมที่มีการเพาะปลูกพืชไร่ ข้าว และ ไม้ผล ทำให้มีการใช้สารกำจัดศัตรูพืชเพื่อควบคุมวัชพืชและแมลงศัตรูพืช ซึ่งสารกำจัดศัตรูพืชเหล่านี้อาจปนเปื้อนเข้าสู่สภาพแวดล้อมและส่งผลกระทบต่อสุขภาพของสิ่งมีชีวิตในพื้นที่รวมทั้งมนุษย์ งานวิจัยนี้มีวัตถุประสงค์เพื่อรวบรวมข้อมูลด้านชนิดและปริมาณของสารกำจัดศัตรูพืชที่ใช้ ตลอดจนความรู้ ความตระหนัก และ พฤติกรรมของเกษตรกรในพื้นที่ทองผาภูมิ จังหวัดกาญจนบุรี โดยการสัมภาษณ์เกษตรกรแบบเฉพาะเจาะจงจำนวน 100 ราย ในช่วงปี 2549-2550 ผลจากการสัมภาษณ์พบว่าเกษตรกรส่วนใหญ่ร้อยละ 84 ใช้สารกำจัดศัตรูพืช โดยสารกำจัดวัชพืชที่นิยมใช้ได้แก่ ไกลโฟเซต และ พาราควอตไดคลอไรด์ ส่วนสารกำจัดแมลงที่นิยมใช้มากที่สุดได้แก่ เมทโธมิล คลอไพริฟอส และ เมธิลพาราไธออน เกษตรกรส่วนใหญ่นิยมใช้สารกำจัดวัชพืชมากในช่วงเดือนพฤษภาคมเนื่องจากเป็นช่วงต้นฤดูฝนที่เกษตรกรต้องเตรียมพื้นที่สำหรับการเพาะปลูก และมีการใช้สารกำจัดแมลงมากในช่วงเดือนเมษายนเพื่อควบคุมการระบาดของเพลี้ย การสำรวจระดับความรู้ ความตระหนัก และ พฤติกรรมของเกษตรกรอันเกี่ยวเนื่องกับการใช้สารกำจัดศัตรูพืชอย่างปลอดภัยพบว่าเกษตรกรมีความรู้เบื้องต้นเกี่ยวกับข้อปฏิบัติตัวในการใช้สารกำจัดศัตรูพืชอย่างปลอดภัย แต่ยังขาดความรู้ในการอ่านฉลากสารกำจัดศัตรูพืช และวิธีการปฐมพยาบาลเบื้องต้นเมื่อได้พิษจากสารกำจัดศัตรูพืช รวมถึงขาดความตระหนักในการระมัดระวังการได้รับสัมผัสสารกำจัดศัตรูพืชในขณะฉีดพ่น

คำสำคัญ : ทองผาภูมิ การใช้สารกำจัดศัตรูพืช ความรู้ของเกษตรกร ความตระหนักของเกษตรกร

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