Pesticide Use in Agricultural Production in Thailand

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Introduction

The use of agricultural pesticides has strongly increased in Southeast Asia as well as in most other developing and developed countries (Schreinemachers, 2012). In Southeast Asia this trend has been driven by land use intensification related to the expansion of higher value crop production and integration of farmers into markets. To stimulate agricultural growth, governments have supported the use of pesticides by creating conditions about prices (Dasgupta *et al.* 2005; Praneetvatakul *et al*. 2013; Van Hoi *et al*. 2013).

Thailand is rich in natural resources and one of the world's leading rice exporters. In Thailand, Agriculture used to be an engine of economic growth. Thai agricultural sector became a major comparative advantage in the international trade. Plus, as being a labor-abundant country, agriculture supplied an industrial sector with cheap labors and other factors of production. The role of agriculture in growth was undeniable.

However, along with the development, agricultural production in Thailand is facing a major challenge, that is overuse of pesticides by farmers which leads to increasing pesticide risks for farmers, consumers, and the environment.

Whereas, nowadays, demand for agricultural products in terms of both quantity and quality are strongly increasing in domestic and export markets. Thus, it is the signal of unsustainable development.

Pesticide use in agriculture

Quantity and value pesticide imports in Thailand

Pesticides were first imported into Thailand in 1966 following the "Green Revolution Policy" and in Thailand, most of pesticides used are imported (Department of Pollution Control, 2005).

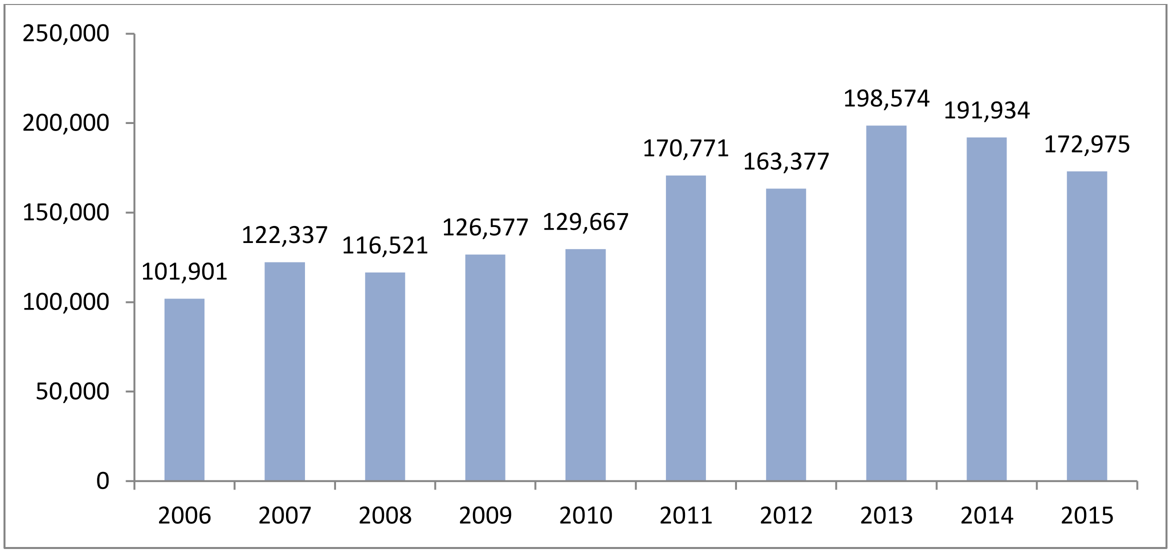

Fig. 1. Quantity of pesticide imports in Thailand from 2006 to 2015
Source: The Customs Department of the Kingdom of Thailand (2015)

From Fig. 1, it can be seen clearly that, there was increasing trend of pesticides imported from 2008 to 2013 and gradual decrease from 2014. Among these, herbicides were the major pesticides with the highest proportion of import followed by insecticides and fungicides.

Along with pesticide increasing imported quantities, total value also rose rapidly from 2006 to 2013 and decreased gradually from 2014. And according to the Department of Agriculture, in 2015, among these, almost 62% of all imports were herbicides, followed by fungicides at 18% and insecticides at 17% (Fig. 2).

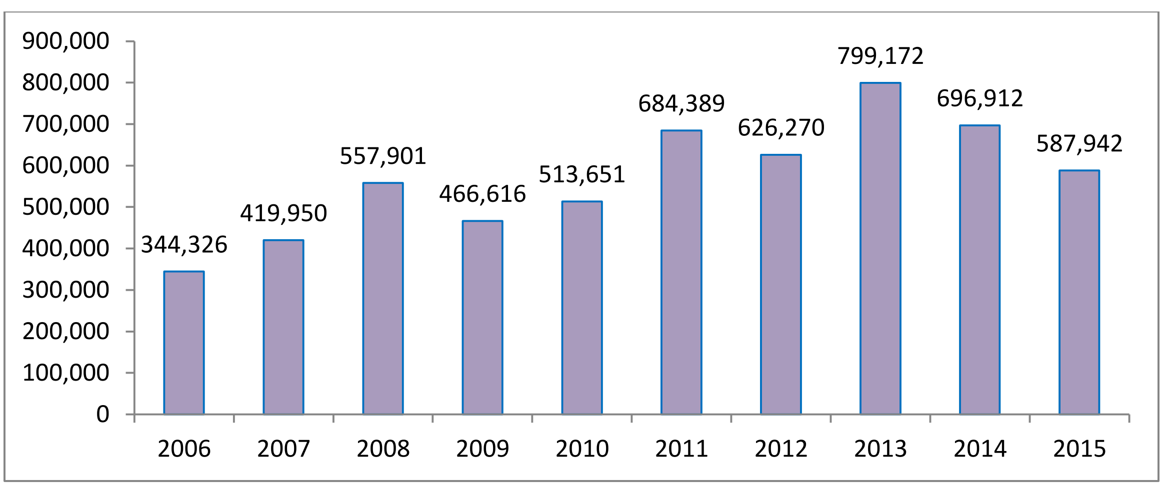

Fig. 2. Value of Agricultural Chemicals Imports in Thailand from 2006 to 2015
Source: The Customs Department of the Kingdom of Thailand (2015)

Therefore, both quantities and total value of pesticideS imported strongly increaseD over the years but it was gradual decreasing trend from 2014. Besides, almost all pesticides imported in Thailand came from China, accounting 77% of the total quantity of lawfully imported pesticides, but only for 47% of its total import value (FAO, 2013).

The amount of pesticide per hectare

The amount of pesticide products applied per hectare increase from 2 kg/ha in 1999 to 7 kg/ha in 2009 and increased to 8.4 kg/ha in 2012 when based on imported quantities per hectare (Praneetvatakul *et al*. 2013). Thus, the quantity of pesticide use strong increased over the past 14 years. However, according to the analysis of Praneetvatakul, 2013 although pesticide per ha increased, pesticide per agriculture output decreased over time. And, when comparing pesticide use intensity between countries, Thailand's pesticide use level is lower than Vietnam, however, it was higher than Laos and Cambodia. (Fig. 3).

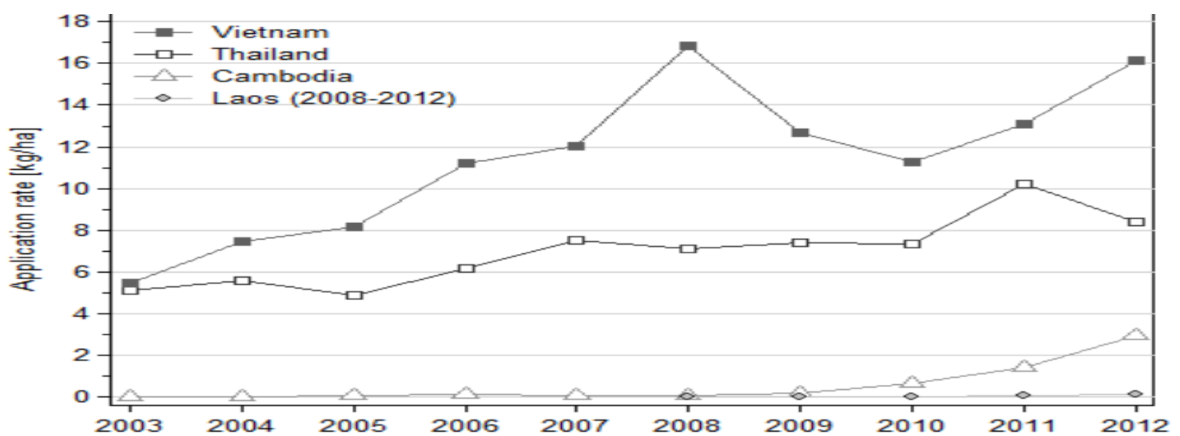

Fig. 3. Agricultural pesticide use in Cambodia, Laos, Thailand and Vietnam, in quantity of imported product per hectare of arable land

Source: Based on Pepijn Schreinemachers et al, 2015

In terms of total amount of pesticides applied in Thailand, almost all were used for vegetables. Dr. Praneetvatakul, 2013 shows that Pesticide use for vegetables was 10 times higher than rice produced in Thailand.

Type of pesticides used in Agricultural production in Thailand

Most pesticides used are highly hazardous including class Ib and class II group (Juthathip Chalermphol & Genesh P. Shivakoti, 2009).

From Table 1, the report shows that in 2009, almost all Thai farmers use the three most popular pesticides: those were abamectin (94.9%), Methomyl 87.8%) and Cypermethrin (70.8%).

Tabel 1. Type of pesticides used in tangerine orchards in Fang district, classified using the WHO Hazard Classifications[a]

Common name	Chemical family	Toxicity class	Status	Number of farmers[b]
Methomyl	Carbanates	Ib	Registered (on watch list)	274 (87.8)
Chlorpyrifos	Organophosphates	II	Registered	197 (63.1)
Cypermethrin	Pyrethroids	II	Registered	221 (70.8)
Carbosulfan	Carbamates	II	Registered	156 (50.0)
Dimethoate	Organophosphates	II	Registered	77 (24.7)
Metalaxyl	-	III	Registered	85 (27.2)
Carbendazim	-	IV	Registered	92 (29.5)
Mancozeb	Thiocarbamates	IV	Registered	132 (42.3)
Abamectin	-	Not listed	Registered	296 (94.9)
Glyphosate	-	Not listed	Registered	59 (18.9)

[a]The WHO recommended classification of pesticides by hazard. International Programme on Chemical Safety. WHO/PCS/01.5.

[b]Figures in the parentheses include percentages of total

Source: Based on Juthathip Chalermphol and Genesh P. shivakoti research (2009)

These kinds of pesticides is highly toxic and has high risk for farmers, consumers and the environment. Farmers often use these pesticides because the farmers concluded that the biological pesticides and other type that they made or bought were inefficient and the qualities of organic products from shops were low and without standard control. The issue was further complicated because biological pesticides require a higher dosage, which requires more spraying and higher expenses (Juthathip Chalermphol & Genesh P. Shivakoti, 2009).

Activities to Pesticide risk reduction

The increasing number of pesticides applied in Thailand to control pests in farms in order to increase agricultural production has been a trend over the years. In fact, Thailand ranked third of 15 Asian countries in terms of pesticide use per unit hectare and fourth in annual pesticide use (FAO, 2008) whereas the agricultural products per unit area of Thailand were relatively low as compared with other countries. Therefore, health problems, incidence of acute pesticide poisoning among agricultural workers in Thailand ranked first out of the four Asian countries including Indonesia, Malaysia, Srilanka and Thailand (FAO, 2008).

Some research shows that there were about 49,000 to 61,000 reported cases of pesticide intoxication each year with morbidity rate between 76.4 and 96.6 per 100,000 populations. The reported cases of the toxic effects of substances during 2007 - 2013 were found predominantly in the Central region of Thailand (31 - 36%), followed by the Northeastern region (27 - 31%), while the annual proportion of the North (18 - 20%) were almost equal to those of the South (18 - 19%). The number of cases usually increased during the growing season of many crops during the rainy season (May - August) each year, and it was found mainly in farmers and farm workers. The highest risk was found in patients aged between 45 and 54 years, followed by the groups of 55 - 64 years and 35 - 44 years, while the poison risks in men was greater than women (Apiwat Tawatsin, Usavadee Thavara, Padet Siriyasatien, 2015).

Thus, to improve food safety and gain consumers' trust in food production and pesticide risk reduction, The Thai Government tried to apply and improve some programs like Integrated Pest Management (IPM), and GAP standard adoption, other activities to pesticide risk reduction.

Integrated pest management (IPM) adopted

In 1992, Thailand started to adopt the IPM program but it was a solely donor-driven activity and the program was discontinued in 1998 (Praneetvatakul et al, 2007).

In 1999, Thailand's King seen benefits from this program. This marked a turning point in the government's attitude towards pesticides. There were more than 1,000 farmer field schools but it was only for vegetables.

An impact assessment study on IPM in rice analyzed a set of panel data collected over a period of over four years in five pilot Farmer Field School (FFS) project sites.

In this research, pesticide risk was measured using the Environment Impact Quotient (EIQ) index. EIQ was built by Kovach and his colleagues at Cornell University in 1992 with the aim to provide information about the impact of pesticides to farmers on farmers and consumer's health, and the environment. EIQ value for a specific active ingredient calculated by the percent active ingredient in the formulation and its dosage rate per hectare used (FAO, 2008).

Results showed that Farmer Field School – Integrated Pest Management (FFS-IPM) farmers significantly reduced their pesticide use in gram active ingredient by 41.7 % after the training, while no significant reduction was observed between the groups on non-participating farmers and control villages. Due to the pesticide reduction, two other parameters linked to pesticide use, i.e. farmer net benefit and EIQ also showed significant differences. There was a difference in the EIQ, because after the training, FFS farmers opted for less toxic pesticides to reduce their health risks. This means there was pesticide risk reduction by IPM adoption (FAO, 2008).

However, cost for pest control followed IPM was high while the promotion of farmer field schools and integrated pest management was not sustained, although the concept still appears in government policies, but support for it is currently minimal. Therefore, it could not continue (Praneetvatakul *et al*., 2013).

Good agricultural practices (GAP) adoption

GAP are practices that address environmental, economic and sustainable society for on-farm processes, and result in safe and quality food and non-food agricultural products.

Regarding the status of the GAP implementation in Thailand, until 2006, 501,663 farms had registered for Q_GAP certification, 407,034 had been inspected and 204,559 farms with 200,860 ha had obtained Q_GAP for 29 fruit or vegetable crops. Among these, most of the certifications for fruits are longans with 85,648 ha durian with 13,853 ha, mangosteen with 13,554 ha and vegetables: chili with 3,400 ha; baby corn with 2,995 ha; and asparagus with 2,893 ha. The Thai government tried to improve food quality and food safety. In 2010, the standard has expanded rapidly with certificates issued to 212,000 farms (Schreinemachers *et al*., 2012).

The government has also tried to rein in pesticide use through regulation. A stricter pesticide registration system was introduced in 2011. Whereas the previous registration was valid for an unlimited period, the new rules limit the validity to six years and required detailed toxicological data to be provided as part of the registration process (Panuwet *et al*., 2012). However, the question is "Can Q-Gap public GAP standards reduce agricultural pesticide use"?

According to report of Schreinemachers, when farmers applied Q_Gap, the farmers suggested that they have to use bio_pesticide or pesticide of III or IV group to reduce pesticide risk but showed that, there was no significance in choosing the type of pesticides. For example, with chinese cabbage: Thai farmers did not adopt Q_GAP used 38% pesticide that are classified as extremely hazardous (WHO class Ia), highly hazardous (Ib), and moderately hazardous (II) in the total quantity of active ingredients used whereas farmers who applied Q_GAP used 55% this group (Schreinemachers *et al*., 2012). In case of tomatoes: non applied group used 32% pesticide that is extremely hazardous (WHO class Ia), highly hazardous (Ib), and moderately hazardous (II) in the total quantity of active ingredients used while farmers who applied Q_GAP used 30% (Schreinemachers *et al*., 2012).

Therefore, it can be shown that Q-GAP certification has no significant effect on pesticide handling or the amount of pesticides used and an insignificant impact on both the average quantity and toxicity of pesticides used.

Conclusion

Thailand is an agricultural country and one of the world's leading rice exporters. Thailand's agricultural sector is growing strong, however, agricultural production is facing a major problem, that is overuse of pesticides. This problem has serious effect on farmers, consumer's health and the environment.

Although, the Thai government has many policies to improve food safety qualities like IPM program since 1992, these could not continue because cost for pest control was high.

Since 2004, the Thai's government has developed 'good agricultural practices' (GAP) as public approaches to improve food safety and qualities. However, there was no significant success. Most of the studies showed that there were insignificant difference between adoption and non-adoption in pesticide use of farmers because of mechanisms of implementation have not been placed under close examination, farmer's lack of knowledge, besides tax exemption for pesticide imports to keep low price that led to overuse of farmers in production. Therefore, pesticide risk is still not considered significant in terms of reduction.

For the sake of strengthening these impacts and ensuring food qualities, The Thai Government should extend training program for farmers about pesticide use to improve farmers' knowledge and increase close examination and monitoring of pesticide use implementation mechanism, specially, with farmers who applied GAP in agricultural production. The Thai Government should also consider the tax policy for pesticides as a tool to help pesticide use reduction in production.

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