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Safe and sustainable crop protection in Southeast Asia: Status, challenges and policy options

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ABSTRACT

This study aims to identify challenges as well as entry points for governments in Southeast Asia and elsewhere to reduce the risk from agricultural pesticides by comparing levels of pesticide use, pesticide regulation, and farm-level practices in Cambodia, Laos, Thailand and Vietnam. We identified three main challenges to pesticide risk reduction: (a) the rapid expansion of pesticide trade—in terms of total volume, number of products and number of selling points, combined with a weak regulatory and enforcement capacity; (b) a high level of satisfaction among farmers with pesticides combined with low levels of risk awareness, lack of technical know-how about integrated pest management (IPM), and general unavailability of biocontrol agents; and (c) no regular monitoring of pesticide risk, which makes it difficult for legislators, regulators, farmers and consumers to make rational decisions. The study highlights several examples countries can emulate, including the introduction of a pesticide tax in Vietnam, the pesticide registration system in Thailand, regular training of pesticide retailers in Thailand and Vietnam, and product certification.

1. Introduction

The use of agricultural pesticides has rapidly increased in Southeast Asia as well as in most other developing and developed countries (Schreinemachers and Tipraqsa, 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 for widespread availability and affordable prices (Dasgupta et al., 2005; Praneetvatakul et al., 2013; Hoi et al., 2013). For instance, in Thailand, the quantity of formulated pesticide products applied per hectare increased from 2 kg/ha in 1999 to 7 kg/ha in 2009 (Praneetvatakul et al., 2013). In Vietnam, the use of agricultural pesticides increased from 20,000 tons/year to 77,000 tons/year during 1991–2007 (Lamers et al., 2013).

The fast rate of this increase poses enormous challenges to manage the associated risks to people and ecosystems. Evidence for widespread pesticide misuse and associated adverse effects is abundant for Thailand (e.g. Boonyatumanond et al., 1997; Thapinta and Hudak, 2000; Stuetz et al., 2001; Asawasinsopon et al., 2006; Kunstadter et al., 2006; Panuwet et al., 2008, 2012; Grovermann et al., 2013; Riwthong et al., 2015). Such evidence is also abundant for Vietnam (e.g. Berg, 2001; Dasgupta et al., 2005; Hoi et al., 2009; Hoai et al., 2011; Lamers et al., 2011). As a result of pesticide misuse, consumers have become increasingly concerned about their exposure to pesticide residues (e.g. Roitner-Schobesberger et al., 2008). The governments of Thailand and Vietnam realize that pesticide misuse harms agricultural exports to high-income countries, but struggle to implement effective regulation to rein in the problem.

For lower-income countries in Southeast Asia such as Cambodia and Laos, there are fewer studies documenting pesticide-related problems (e.g. Neufeld et al., 2010; Jensen et al., 2011). Until recently, their agricultural development as well as general economic development stagnated and average levels of agricultural pesticide use were low. Yet these countries are now experiencing rapid economic growth and falling levels of poverty

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(Table 1). Their growth in agriculture is spurring growth in pesticide use—similar to what was experienced by their higher-income neighbors (see Schreinemachers and Tipraqsa, 2012).

This study addresses what Cambodia and Laos can learn from their neighbors' experience, both positive and negative, to minimize the risks to people and ecosystems from pesticide misuse. More generally, it aims to identify challenges as well as entry points for governments in Southeast Asia, and elsewhere, to promote safer and more sustainable methods of crop protection. In this context, "safe and sustainable" refers to methods of crop protection that have a low risk for farm workers and their families, consumers and the environment; it does not necessary imply agricultural production without synthetic pesticides. The study meets its aim through a comparison of pesticide regulation and farm-level practices in Cambodia, Laos, Thailand and Vietnam.

The remainder of the paper is organized as follows. We start by describing the method of data collection and sources of data. After describing recent trends in agricultural pesticide use, we focus on pesticide regulation—those that regulate the supply of pesticides such as retail requirements, pesticide licensing and registration, and those that influence farm-level demand such as standard setting and the promotion of integrated pest management (IPM) practices. The discussion highlights the main entry points and challenges that emerged from the comparison. The paper ends with a conclusion.

2. Material and methods

We applied published guidelines for conducting a pesticide policy situational analysis (WHO, 2005; FAO, 2010), but extended these based on own experience and interest to include not only policy issues but also the opinions of farmers and pesticide retailers. The authors first agreed on a pre-defined list of questions for eliciting responses. Using this list, we collected data in the last quarter of 2013 by interviewing government officers at national and subnational levels in key government agencies that deal with crop protection and food safety. Annex 1 lists the government offices visited for this study. Regulations, policy documents and scientific literature were also studied.

We selected three villages (four in Vietnam) representing contrasting farming systems in each country for in-depth focus group discussions on selected topics to validate and/or augment the responses from government officials. Annex 2 lists the locations. One village with rice production (the dominant production system in Southeast Asia), one with horticultural production, and one with upland agriculture were selected purposively based on the researchers' experience. Data collected from the village discussions complemented the policy-level interviews with farm-level information, illustrating local experiences and opinions. In each village, the village headmen were asked to select about 10 farmers to join a focus group discussion. Selected farmers had an interest in the topic and were available at the time for the meeting. The actual number of participants varied from on average of 8 in Thailand to 30 in Cambodia, where we had to split the participants into two subsequent sessions to allow everyone to join. The discussions covered a range of topics on pesticide usage and practices, including pest and disease problems, the selection of pesticides, sources of information, awareness about adverse health effects, and available alternatives to synthetic pesticides. Local pesticide retailers located in or nearby the study villages were interviewed separately from the farmers to capture potentially opposing opinions. Their interviews included questions about what they thought were the main problems related to pesticide use in the village, the types of products they sold, the training they had received, and the advice they gave to farmers. Farmers and retailers were also asked for their opinions and suggestions on sustainable pest management approaches compared with current practices.

Table 1
General characteristics of agriculture in the sampled countries, 2012.

	Cambodia	Laos	Thailand	Vietnam
Population (million)	14.6	6.5	66.6	87.8
Rural population (%)	79.8	64.7	65.5	68.3
Population density (people/km^2)	82.7	28.3	130.3	283.3
Poverty headcount ratio at PPP ($1.25/day)[1]	18.6	33.9	0.4	16.9
Per capita GDP (current US$)	945	1408	5480	1755
GDP growth (% per annum)	7.3	8.2	6.5	5.2
Arable land (million ha)	4.0	1.4	15.8	6.5
Land productivity (million US$/ha)[2]	1108	1642	2926	4187

Source: The World Bank (2014). Note: [1]Purchasing power parity. [2]Agricultural value added per arable land in million current US$/ha.

3. Results

3.1. Trends in agricultural pesticide use

Fig. 1 shows the trend in agricultural pesticide use over the past 10 years as obtained from ministries and based on customs import records. The data shown are indicative of trends but must be interpreted with caution as they only refer to registered imports. Some countries re-export pesticides, legally or illegally, after formulation and repackaging. Illegal pesticide imports also account for a substantial share of actual use. Only Vietnam has started to produce synthetic pesticides domestically, but government officials we interviewed confirmed that it is a negligible amount of the total volume used.

The data show clear differences in average pesticide application rates between Thailand and Vietnam on one hand, and Laos and Cambodia on the other hand. These differences mostly reflect variations in land use intensity as indicated in Table 1. Average application rates based on imported quantities per hectare (ha) of arable land in 2012 were 16.2 kg/ha in Vietnam, 8.4 kg/ha in Thailand, 2.9 kg/ha in Cambodia and 0.1 kg/ha in Laos (Table 2). The application rate for active pesticide ingredients per hectare

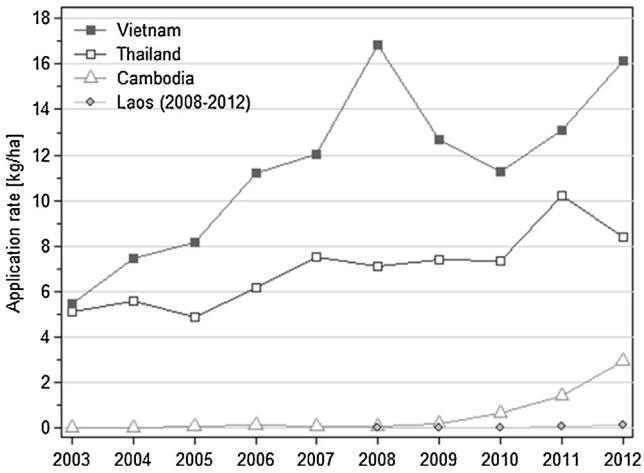

Fig. 1. Agricultural pesticide use in Cambodia, Laos, Thailand and Vietnam, in quantity of imported product per hectare of arable land, 2003–2012.
Data on quantities of imported pesticides based on customs import records and obtained through interviews at the Ministry of Agriculture Forestry and Fisheries (Cambodia), Department of Agriculture (Laos), Office of Agricultural Economics (Thailand), and Plant Protection Department (Vietnam). Data on arable land area obtained from World Bank (2014).