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Pesticides, external costs and policy options for Thai agriculture

Suwanna Praneetvatakul [a], *Pepijn Schreinemachers* [b,d,*], *Piyatat Pananurak* [c], *Prasnee Tipraqsa* [d]

[a] *Department of Agricultural and Resource Economics, Kasetsart University, Bangkok, Thailand*
[b] *Department of Land Use Economics in the Tropics and Subtropics, Universität Hohenheim, Stuttgart, Germany*
[c] *Knowledge Network Institute of Thailand, Bangkok, Thailand*
[d] *The Uplands Program, Chiang Mai University, Chiang Mai, Thailand*

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ABSTRACT

This study addresses the questions of how to estimate the external costs of agricultural pesticide use and how to disaggregate these costs to particular chemicals and farm production systems. Using the case of Thailand—a lower-middle income country with an export-oriented agriculture and an annual growth in pesticide use of about 10%, we estimate the external costs of pesticide use for the period 1997–2010 by applying the Pesticide Environmental Accounting (PEA) tool and compare the estimates to an accounting of actual costs for two years. We also use the tool to estimate the external costs of two distinct production systems of rice and intensive horticulture. Using the PEA tool, we estimate the average external costs of pesticide use in Thailand to be USD 27.1/ha of agricultural land in 2010; yet the actual cost estimate for the same year is only USD 18.7/ha. This difference leads us to discussing the strengths and weaknesses of the PEA approach. The negative externalities of pesticide use could be reduced by giving farmers a financial incentive to use fewer pesticides, for instance by introducing an environmental tax. We argue that for such instrument to be effective, it needs to be combined with supportive measures to change on-farm practices through awareness-raising about the adverse effects of pesticides and introducing farmers to non-chemical alternatives to manage their pest problems.

1. Introduction

Higher income countries use substantially more pesticides per unit of output and per unit of land than lower income countries, but the risks pesticides pose to consumers and farm workers are generally considered to be greater in many lower income countries, due to their incorrect use and due to the reliance on broad-spectrum pesticides that are more hazardous (Carvalho, 2006; Konradsen et al., 2003). Lower income countries with strong economic and agricultural growth are also experiencing a rapid increase in the intensity of pesticide use and a concomitant increase in pesticide risk (Schreinemachers and Tipraqsa, 2012). The pace of this increase in pesticide use can be explained by a policy framework that promotes pesticide consumption, a loss of natural predators due to simplifications in field ecosystems as part of the process of agricultural intensification, the

* *Corresponding author at*: AVRDC - The World Vegetable Center, P.O. Box 42, Shanhua, Tainan 74199, Taiwan. Tel.: +886 6 583 7801x463; fax: +886 6 583 0009.
E-mail address: p.schreinemachers@gmail.com (P. Schreinemachers).
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development of pesticide resistance among pests and the fact that farmers find pesticides easy to use—providing them with a convenient way to control pests (see Xu et al., 2008 for the case of China).

Increased pesticide use and the associated risks therein, pose enormous challenges for lower income countries that lack the institutional framework to effectively manage these risks, that lack the institutional capacity to enforce even the existing framework, and whose farmers have only a limited knowledge and awareness about the proper use of hazardous chemicals. These challenges are even more problematic in those countries which have shown the greatest increases in pesticide use, such as Brazil, Argentina, Mexico, Thailand and Malaysia (Schreinemachers and Tipraqsa, 2012). Each of these countries are trying to position themselves as major exporters of agricultural produce, but have to cope with increasingly strict food safety laws of importing countries (*e.g.* Okello and Swinton, 2010) and their increasingly affluent domestic consumers become concerned about the contamination of food with pesticide residues (*e.g.* Posri et al., 2006).

This study illustrates this challenge using the case of Thailand—a lower-middle income country with an export-oriented agriculture and rapid growth in the level of pesticide use. Previous studies have shown that the contamination of food with pesticide residues is a serious problem in Thailand (*e.g.* Athisook et al., 2006; Panuwet et al., 2012; Tanabe et al., 1991). As in many other countries, the Thai policy debate on agricultural pesticides tends to focus on banning specific chemicals that are deemed highly hazardous, particularly carcinogenic pesticides. Such decision to ban should ideally be based on an analysis of costs and benefits, yet no such information currently exists in Thailand and so debates on what pesticides to ban have been prone to arguments based on ideology and commercial interests.

Against this backdrop, this study addresses the questions of how to estimate the external costs of pesticides in agriculture, and how to disaggregate these costs to particular chemicals and farming systems. The only method currently available for quantifying the external costs of individual active ingredients or production methods is the Pesticide Environmental Accounting (PEA) tool developed by Leach and Mumford (2008, 2011). Yet, the tool was calibrated with data for high-income countries (Germany, UK and USA) and benchmarks are needed to assess how the tool performs if applied to lower income countries. We therefore test the use of the PEA tool by comparing it to actual cost estimates for 1996 and 2010, and use it to estimate the external costs of two distinct production systems of rice and intensive horticulture.

The paper starts in the following section by describing the development of agricultural pesticide use in Thailand and how policy making has evolved from an initial focus on promoting pesticide use to more recent efforts aimed at reducing it. We then present the external cost estimation approach that was applied in this study, both at the national level and for the two distinct cultivation systems. After presenting the results, we then discuss the pros and cons of using the PEA tool as well as the policy options that give farmers an incentive to take these externalities into account.

2. Agricultural pesticide use and policy development in Thailand

Thailand experienced a six-fold increase in the quantity of formulated pesticide products applied per hectare over the period 1987–2010 (Fig. 1). Regressing the logarithm of pesticide use on the number of years, we estimate an average growth of 8.8% per annum ($p < 0.01$) over the whole period, yet since the turn of the century this growth has been close to 10% per annum ($p < 0.01$). The growth in pesticide use has far outstripped the growth in agricultural output, as can be seen from the constant decline (−7.4% per annum) in pesticide productivity (*i.e.*, output per unit of pesticides): whereas Thailand produced USD 400 of agricultural output per kg of formulated pesticide products in 1987 this was only USD 100 in 2009.

Most of the increase in pesticide use since 1997 can be attributed to increased herbicide use, and especially the use of glyphosate and paraquat, two controversial herbicides which use has been restricted in several countries but not in Thailand. These two herbicides accounted for 41% of all active ingredients used in 2010. Three interrelated factors are likely to have driven this increase in herbicide use: The rising costs of agricultural labor, land use change (particularly the expansion of plantation crops such as palm and rubber), and a greater liquidity among farmers as higher revenues and subsidized farm credit programs give them a chance to buy more inputs.

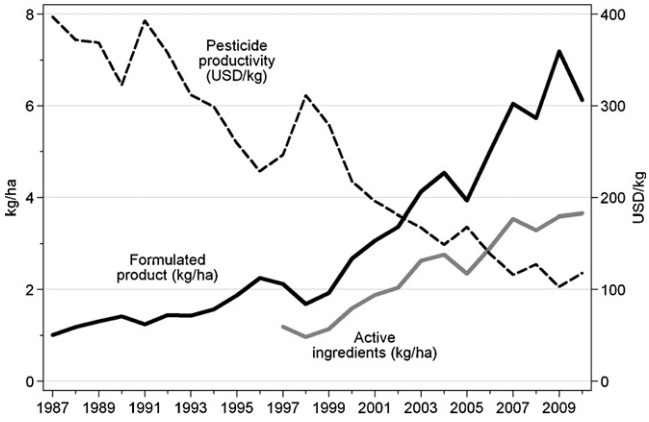

Fig. 1 – Agricultural pesticide use and pesticide productivity in Thailand, 1987–2010 ***Notes*****: Output based on the value added for agriculture at constant (year 2000) prices in USD. Pesticides here include insecticides, herbicides, fungicides, acaricides, rodenticides, fumigants and molluscicides. Pesticide consumption data are based on imports. This gives a reasonable estimate of pesticide use as importers are legally required to declare that chemicals are destined for agricultural use and the domestic production of synthetic pesticides is negligible.** ***Sources:*** **Thapinta and Hudak (2000), Office of Agricultural Regulation (2011), FAO (2011a), The World Bank (2011).**