Quantifying and mapping Southeast Asia's pesticide usage

Background & study rationale

In many parts of Southeast Asia, the agriculture sector epitomizes both the opportunities and challenges to sustainably contribute to development goals. On the positive side, agriculture can contribute considerably to income generation, nutrition, gender equity, eco-efficiency and environmental protection. On the other hand, agricultural production often involves suboptimal management practices, in terms of input use, quality control, impact on the environment, and grower profitability. In several Asian countries, collaborative R&D and extension schemes have fallen short of promoting sustainable agriculture, due to a lack of holistic approaches, deficient training of extension agents, and a limited understanding of farmer needs and constraints (e.g., George et al., 2005). To remediate such, demand-driven extension schemes and scientifically-sound R&D are sorely needed in a range of Asian agricultural sectors, including but clearly not limited to vegetable and fruit-growing.

Escalating pest problems, deficient national research capacity and anemic rates of IPM adoption are hurting Asia's smallholder farmers in their effort to market produce to local/global consumers, whom are increasingly conscious of food safety and environmental management. With the absence of a strong legal framework or a lack of real enforcement when existing (failing to prevent illegal importation of fake agrochemical products), powerful agro-chemical companies and over-supply of cheap, low-quality pesticides, IPM advocates continue to fight an uphill battle (Thuy et al., 2012). Also, mounting numbers of invasive pests are spreading through SE Asia and increasingly triggering pesticide overuse. This irrational pesticide usage (and disposal) is bringing about far-reaching pollution of groundwater, surface water, and soil, and induced health problems. Escalating public health and environmental problems further accentuate a need for more effective IPM programs, ambitious farmer training modules and bold scaling-up approaches (see Van Hoi et al., 2013). Since 1992, FAO-supported initiatives have actively promoted IPM for a diverse range of pests, but these efforts have been unable to halt aggravating pesticide overuse in several crops. Despite an increasing need and scope for integrated pest management (IPM), pesticide-reduction schemes and biological control, regionally-orchestrated initiatives and sustained (targeted) efforts are now required to promote non-chemical or agroecology-based pest management packages.

Over two million rice farmers in Asia and Southeast Asia participated in rice integrated pest management (IPM) farmer field schools (FFS) between early 1990, when the first FFS was conducted in Indonesia, and the end of 1999. During those 10 years, farmers, agriculture extension field workers, plant protection field workers and NGO field workers learned how to facilitate the FFS approach and conducted over 75 000 FFSs (John Pontius, Russell Dilts, Andrew Bartlett, 2002).

In countries like Vietnam, the Ministry of Agriculture and Rural Development (MARD) established in the mid-1990s its National IPM program. FAO-endorsed farmer field schools (FFS) and Community IPM schemes enabled massive (participatory) farmer training programs, and educated hundreds of thousands of growers on rational pesticide use (e.g., Pretty, 2003; Bottrell & Schoenly, 2012). In these campaigns, national, province- and district-level offices played a prominent role linking to rural communities, and engaging individual farmers and grower associations. Over a span of 20 years, >3,000 PPD officers were trained on IPM, about 6,000 farmers participated in trainer-of-trainer (ToT) programs, and >1 million male and female farmers immediately took part in IPM FFS. Over this time period, most Vietnamese IPM training events were on rice, with far less attention to other crops (e.g., vegetables, cotton, maize, tea, citrus, soybean). In the late 1990s, the National IPM program shifted gears, and enriched and diversified its farmer training repertoire by adding on innovative extension approaches, such as strategic use of radio soap opera and television spots (e.g., Heong et al., 2008). While FFS and mass media extension campaigns did reach millions of Vietnamese rice producers, farmers' reliance on pesticides as the main means of pest control remained largely unchanged (Escalada et al., 2009). The modest outcomes of nearly 15 years of highly intensive IPM training stress the supreme challenge of bringing about (sustained) behavior-change amongst Vietnamese rice growers and (indirectly) Asia's farmers. Hence, considering the far lesser attention that has been given to IPM in a whole range of other crops, it is essential to get a full grasp and regional perspective on the extent of pesticide (over-)usage and associated socio-economic of biophysical determinants.

So far, no comprehensive, multi-country assessments have been done of pesticide-related risks to the environment, grower health, or farmer welfare. In this respect, maps constitute a most powerful tool to communicate the outcome of environmental risk assessment to different types of stakeholders, including policymakers and the general public (Lahr & Kooistra, 2010). The generation of appropriate cartography on pesticide use patterns in Asia's agro-landscapes can improve communication and contribute substantially to future risk management, prioritization and mitigation action.

Overall objectives & approach

The main objective of this exploratory research initiative is to get an initial appreciation of **pesticide usage patterns** in key agricultural crops[1] within several SE Asian countries, and to **visualize associated environmental risks and socioeconomic implications**.

More specifically, this exploratory research initiative proposes to address the following objectives (each the focus of a subsequent priority action). Some of the objectives (1-2) will be addressed in priority and in the first part of this initial research and other (3-5) will come later.

1. To consolidate and centralize available information on crop-specific pesticide use patterns, as obtained through multiple data sources, for a select set of agricultural communities in min. 3 different countries;
2. To generate an accurate, fine-grained map of pesticide-usage patterns, as organized by crop, country, active ingredient and/or target pest (with particular attention of utilization of generic produce or banned substances);

[1] Rice, Maize, Cassava, Coffee, Rubber, Mango, Litchi, Banana, Tomato… Additional crops could be: cabbage, watermelon, Thai basil (or other herbs). Such pre identified commodities will be re assessed and potentially completed with information collected in the preliminary phase of the study depending on which are the most important in each country.

3. To develop initial environmental risk maps for different sets of commodities, farm typologies and geographies, and to make spatially-explicit inferences regarding the impact of pesticide use on farmer income and household economics;
4. To gain initial insights into knowledge, attitudes and practices, related to pesticide use and pest management decision making among extension workers, pest management professionals, agro-chemical supplies agents, and farmers;
5. To formulate scientifically-underbuilt recommendations for farm-level interventions to safeguard (or restore) agro-ecosystem health and ecosystem functioning;

Expected Outcomes: By end of the first part of the research, a set of informative pesticide risk maps is available with different levels of spatio-temporal resolution.
Later on, an initial listing is done of potential constraints, knowledge gaps and appropriate intervention strategies for future farmer extension programs and R&D actions. Necessary materials are facilitated to generate country-specific policy-briefs, fact sheets and bulletins for different target audiences and stakeholders.

Expected timeframe: it is anticipated that a first data consolidation and initial mapping will be carried out by the first semester 2017

Principal Beneficiaries: Agricultural producers who primarily rely on chemically-synthesized insecticides to combat a set of (invasive and endemic) agricultural pests and diseases. Agribusiness companies who experience limited marketing and export opportunities due to presence of pesticide residues in harvested produce. Consumers who are subject to a range of (regularly undocumented and under-reported) health impacts, related to consumption of pesticide-contaminated produce. National governments and policy makers, who may require further guidance on pesticide-related risks to consumer and farmer health, natural environments, and farm sustainability.

Principal Partnerships: Through the Agroecology Learning Alliance in South East Asia (ALiSEA) supported by GRET and CIAT, partnerships will be established with plant protection and extension agencies of each country, local universities, local NGOs and different types of grassroots organizations. Furthermore, strategic planning will be carried out together with the FAO Regional Asia-Pacific office.
Due to rather limited resources, it is anticipated to rely secondary data from government agencies, and field level data from ALiSEA members, PAN-AP and any other relevant and willing local partners.