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The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries: Cambodia, China, Indonesia, Laos, Malaysia, Papua New Guinea, the Philippines, Sri Lanka, Thailand, and Viet Nam. Its goal is to strengthen local capacity for the economic analysis of environmental problems so that researchers can provide sound advice to policymakers.

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Ignoring the Labels: Pesticide Use in China

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China, like many developing countries, has seen a dramatic increase in the use of pesticides and other agricultural chemicals over the last twenty years. In order to get a clearer understanding of the consequences of pesticide use, a team of researchers from the Center for Chinese Agricultural Policy recently undertook an in-depth analysis of the way the chemicals are used in rice production. They found that pesticides were being grossly over-used and that this was having a marked negative impact on farmers' health and their economic well being. The researchers concluded that changes in agricultural training and alternative methods of pest management are needed to improve the situation. →

A summary of EEPSEA Research Report 2001-RR3, *Farm Pesticides, Rice Production and the Environment*, by Jikun Huang, Fangbin Qiao, Linxiu Zhang and Scott Rozelle (Center for Chinese Agricultural Policy, Chinese Academy of Agricultural Sciences, 30 Baishiqiao Road, Beijing 100081, China; contact: jikun@public.bta.net.cn)

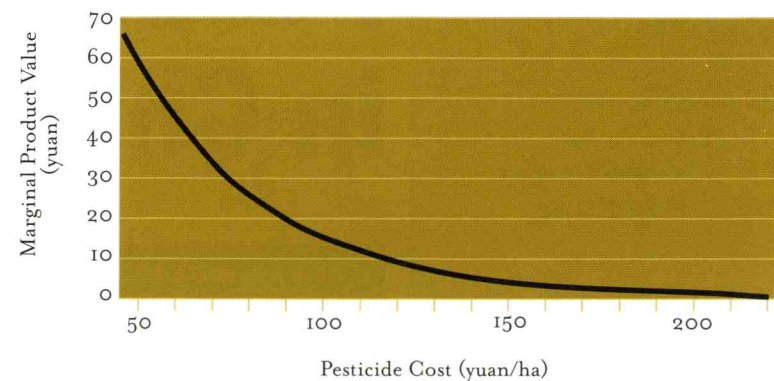
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Farmers overestimate *crop losses from pests*

→ The study, undertaken by a large team led by Jikun Huang, studied rice production in Zhejiang province. Rice, which accounts for about 40 percent of China's grain production, is the province's major crop. Although a lot of work has been done on the level of pesticide use in China, this was the first attempt to quantify its impacts on agricultural production and farmers' health. To get the information they needed, the principal investigators worked closely with officials from the Ministry of Agriculture, Agricultural Bureaus, Crop Plant Protection Stations and county hospitals. Among the questions they asked were: What is the extent of pesticide overuse by farmers? What are the major factors that affect the amount of pesticides farmers apply? And what are the impacts of pesticide use on crop production, the environment and farmers' health? Results from their field studies were cross-referenced with an extensive set of literature on agricultural chemical use across China.

The Zhejiang study was carried out against a background of escalating pesticide use caused by intensive cultivation, and the widespread

Benefits of pesticide use diminish ...



adoption of fertilizer-responsive varieties, over the last two decades. Per hectare pesticide use in grain production more than tripled during this time. By 1996, total pesticide supply reached about 340 thousand tonnes and China is likely to become the biggest pesticide consumer in the world. During the last ten years this has resulted in many health problems with up to 123,000 people poisoned from pesticide use in a year. Indeed, deaths from the improper use of pesticides in crop production run at about 300 to 500 per year. If practical alternative pest management technologies, regulations and policies are not developed, then an increase in these problems can only be expected.

Too Much of a Good Thing?

In Zhejiang, the researchers found that the rate of pesticide use is more than double the national average. Average application of pesticide per hectare of rice (per season) amounts to 27.7 kilograms in dosage or about 12 to 14 kilograms in active ingredients. This is similar to the levels found in Japan and the Republic of Korea, but much higher than in any other Asian country.

Better Information is Crucial

In light of this level of usage, the researchers set out to determine whether the quantity of chemicals they used actually helped farmers increase productivity. They found

that, while pesticides contribute significantly to rice production, the benefit from increasing dosages declines considerably as the total amount of pesticide used climbs. In fact, they found that the benefits of using any additional chemicals was almost zero at current average usage levels. In general, the researchers estimated that farmers were over-using pesticides by more than 40 percent.

To find out why farmers were using such a lot of chemicals, the team investigated attitudes toward pesticide use. To see which factors were affecting the behaviour of farmers significantly, the researchers constructed a hypothetical "behavioural" model. Analysis of this model allowed them to show that, not unexpectedly, it was the farmers' perceptions of yield loss that had the largest effect on how they

applied pesticides. Farmers were found to grossly overestimate the crop loss due to pests: the average farmer's perception of yield losses was nearly twice the loss that actually occurred when no pest control was used. It was also clear that most farmers simply did not believe the recommendations and prescriptions on pesticide labels. Econometric analysis showed that education, farm size, occupation and the quality of village level extension systems were also all major determinants of how farmers perceived yield loss. It is therefore clear that providing farmers with better information is crucial in achieving reduction in pesticide use.

Once it was clear that pesticides were being misused, the researchers then looked at the health impact this was having. The farmers they interviewed reported eye effects,

headaches, skin problems, liver problems and neurological effects amongst others. To get meaningful data on the extent of these problems, the researchers used lab tests that examined at blood, liver, kidney, neurological and other systems. They found that of 100 farmers examined, 22 had impaired liver function, while 23 had abnormal levels of key chemicals in their kidneys.

Paying the Price in Poor Health

Based on this medical information, the researchers calculated the health costs of pesticide misuse resulting from visible acute health impairments. These costs included expenses for medication, physical examination fees and time lost in recuperation from illness. They found that at current levels of use, the average health cost per yuan of category III and IV pesticides is 0.19 yuan or 0.17 yuan.* This was equivalent to about 15 percent of pesticide costs. From this, the researchers suspected that the health costs due to pesticide misuse could well be greater than the farmers'

* 8.3 yuan = 1 USD.

Pesticide use and health cost in 100 sample households (8.3 yuan = 1 USD)

Pesticide cost per farm	No. of farms	Pesticide application	Health cost (yuan)
Less than 9 kg	34	6 kg	9
Between 9 and 15 kg	33	12 kg	24
Over 15 kg	33	25 kg	33
Less than 100 yuan	36	74 yuan	11
Between 100 and 150 yuan	35	121 yuan	21
Over 150 yuan	29	260 yuan	36



total pesticide bill. Indeed, when they weighed up the economic costs and benefits of pesticide use, the researchers concluded that the optimal use levels for pesticides in rice production was probably less than half those currently used.

From this study it is clear that pesticides are a double-edged sword in the battle against pests. When used incorrectly, their negative effects can outweigh the benefits they might bring. Farmers are generally unaware of this, however, so solutions must not only involve regulations, but must also educate farmers about proper use of pesticides and help them find better alternatives.

See also:

Impact of Agro-Chemical Use on Productivity and Health in Vietnam, by Nguyen Huu Dung et al. (1999-RR1)

Economic and Health Consequences of Pesticide Use in Paddy Production in the Mekong Delta, Vietnam, by Nguyen Huu Dung and Tran Thi Thanh Dung (1999-RR2)

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