SANDEE
South Asian Network for Development and Environmental Economics

POLICY Brief

Number 19-07, March 2007

Facing Hazards at Work – Agricultural Workers and Pesticide Exposure in Kuttanad, Kerala

Pesticides are responsible for hundreds of cases of poisoning in the developing world, where information and training on the potential negative health effects of these chemicals is often lacking. While the impact of the indiscriminate use of toxic chemicals is widely acknowledged, the economic costs of this misuse are less well known. This has held back investment in the necessary health and safety programmes that can safeguard people's well-being.

Now a new SANDEE study from India shows that many rural workers pay a high economic price for pesticide use in terms of their health. This can amount to up to a quarter of an individual's daily earnings. The study finds that these health costs can be considerably reduced if pesticide doses are lowered or small changes are made in the types of pesticides used. It also finds that there is ample scope for reducing pesticide exposure through training and agricultural extension services.

THE RICE BOWL OF KERALA

The study is the work of P. Indira Devi from the Department of Agricultural Economics at Kerala Agricultural University, India. It looks at pesticide use in the ecologically-sensitive rice growing area of Kuttanad in Kerala. This is a low-lying area near the coast and is known as the rice bowl of Kerala. Paddy is virtually the only crop grown in this area, as poor drainage conditions make most of the land unsuitable for other crops. Rice cultivation in Kuttanad is more intensive than in many other parts of the state. Nearly 90% of the farmers sow high-yielding varieties and this means they have to use high levels of chemical inputs. Moreover, the area is prone to pests such as Brown Plant Hopper, which again leads to high levels of pesticide use.

The study details the acute health effects of pesticide exposure among the different types of agricultural laborers in the region and assesses the monetary health costs associated with this exposure. The aim of the study is to provide information that will help shape policy on improving the health of those workers who are affected by pesticide exposure. It also aims to give an economic rationale for any investment in training and safety programs. The study is based on information collected from a random sample of pesticide applicators and agricultural laborers. 280 Pesticide applicators were surveyed who work during the peak spraying season. Over 100 agricultural laborers also took part in the survey. They engage in farm operations such as ploughing, fertilizer application and land preparation, but do not undertake pesticide spraying. Information was collected through a structured questionnaire and through a farm diary. Direct observations were also made wherever possible.

CHEMICAL USE IN KUTTANAD

Chemicals are used to protect crops in Kuttanad against the pest brown plant hopper, the rice bug and leaf folder. Spraying is done with a knapsack sprayer and is generally not supervised. Crucially, the dose of the spray fluid used is much higher than the recommended level (either based on the advice of the Kerala Agricultural University or from information provided by pesticide manufacturers). A total of 19 pesticides are used, of these 12

This policy brief is based on SANDEE working paper No. 20-07, 'Pesticide Use in the Rice Bowl of Kerala: Health Costs and Policy Options' by P. Indira Devi from the Department of Agricultural Economics, College of Horticulture, Kerala Agricultural University, Thrissur - 680 654, India. The full report is available at www.sandeeonline.org

are insecticides; four are fungicides and three weedicides. Over 50% of chemicals used are highly toxic (these are colour coded red), while over 20% are extremely toxic (colour coded yellow).

Worryingly, applicators perceive the toxicity levels of the chemicals they use to be lower than they actually are. Only about a third of the applicators read the information labels on the chemical containers they use, while only 2.5% take steps to follow the instructions. A mere 1.5 % understands the toxicity level associated with the color code system used in the region. That said, the majority of the respondents are aware of the potential health hazard linked to pesticides and the need for personal protection. However, none of them use the suggested protective measures, which include face-masks with replaceable filters and rubber gloves. Cost, general lethargy, and discomfort are the main reasons why such devices are not used. Some 'make shift' protection is used, such as shirt sleeves or a cloth wrapped around the nose, however such measures offer little defense.

PESTICIDE USE IN KERALA

Pesticide poisoning in Kerala has a long history. The State became the focus of interest and research in 1958 following the death of more than 100 people who had consumed wheat flour that had been contaminated with pesticides during transportation. The long-term impact of pesticides in the state has been highlighted in a 1993 study undertaken by the Thiruvananthapuram Medical College. This looked at the Kuttanad rice area of Kerala and found a very high occurrence of cancer of the lip, stomach, skin and brain, lymphoma, leukemia and multiple myloma. These were linked to the high pesticide use in the area. A recent survey conducted by a volunteer group makes a similar observation regarding the rising trend in the number of cancer patients in Kuttanad and identifies pollution as one of the reasons behind it. Reports on the reduction in local fish populations and massive deaths due to ulceration in fish in Kuttanad also appear very frequently in the local media – again linked to pesticide use.

The situation in Kerala is mirrored elsewhere in India. Pesticide use in India dates back to the year 1948 when DDT and BHC were imported for malaria and locust control. Currently, India is the No. 1 manufacturer of basic pesticides in Asia and ranks 12th globally. Insecticides account for 75 per cent of India's total pesticide consumption, followed by fungicides (at 12 per cent) and herbicides (at 10 per cent). Over 50 percent of the total quantity of pesticides used in the country is used in cotton, with 17 per cent in rice and 13 per cent in vegetables and fruits.

The pesticide residues in food in India, especially vegetables, are the highest in the world. Persistent pesticides like BHC and DDT remain in the ecosystem for longer periods and contaminate soils and water. Chemical pesticide residues have often been detected in food grains, vegetables, fruits, oils, cattle feed and fodder in most parts of the country. About 72 per cent of food samples in India have shown the presence of pesticide residues within tolerance levels while in 28 per cent of samples they are above the tolerance level. On a comparative basis, very high levels of organic chlorine compounds have been reported in human blood, fat and milk samples in India. As a consequence, India accounts for one-third of all pesticide poisoning cases in the world.

HEALTH IMPACTS

Skin problems are the most common problem linked to pesticide use in Kuttanad, itching, eye-irritation and vision problems are also very common. These are regarded as minor ailments and are often managed by the workers themselves using home remedies or traditional ayurvedic treatment. A number of more severe symptoms are also reported, for which farm workers either go to a doctor or hospital. These include breathing problems, dehydration, vomiting, cramps and diarrhea. There are 76 cases of hospitalization among the 894 cases of sickness reported in the survey.

A dose-response model is used to put a figure on the physical impact of pesticide use. This approach sets out a statistical relationship between

exposure to pollutants and health risks and makes it possible to estimate how likely an individual is to get sick. It also makes it possible to take into account and control for the effects of other factors such as temperature and whether or not the farmers smoke or drink alcohol. It was found that the probability that pesticide applicators would get sick during the days they are spraying is 0.72. Not surprisingly, this is significantly higher than the estimate for when they are not spraying (0.64) and for agricultural laborers who do not spray (0.63). Sickness is broadly defined to cover a variety of pesticide-related symptoms, but some of these symptoms may be associated with other problems such as exposure to the sun or fever. This is why the author focuses on the extent to which applicators get sick during spraying time *relative* to when there is no exposure.

To assess the impact of different policy options, the author undertook a simulation exercise and calculated the probability of sickness in a number of different scenarios in which the dose of different pesticides is reduced. A reduction in the dose of all chemicals by 10% reduces the probability of sickness for pesticide applicators when they are spraying to 0.61. The same result is obtained by reducing the dose of the most toxic chemicals (red) by 25%. If applicators can be persuaded to substitute the safest chemical for the most toxic, their probability of falling sick as a result of exposure is 0.64, which is identical to the probability of falling sick when not exposed.

THE COST OF ILLNESS

A cost-of-illness (COI) approach is used to estimate the economic costs of pesticide use. This approach involves estimating various medical costs plus the wages workers lose by taking time off from work due to health problems. The COI for the applicators when they are not spraying is Rs 3 per day. This is the same as the COI for agricultural laborers. The COI for applicators while they are spraying is Rs. 41 per day. The difference (Rs.38) represents the cost due to pesticide exposure. This is 24 %approximately a quarter of the average daily earnings of the applicators. Assuming that applicators spray pesticides an average of 42 days per year, the average annual welfare loss to an applicator from pesticide exposure amounts to Rs.1,596 (US$ 36)(US$ 36). About 110,000 workers apply pesticides in Kerala, this means that the welfare loss in the region from pesticide exposure amounts to about Rs 180 million per year. It should be noted that these costs are a conservative estimate because they do not take into account long-term chronic illnesses and public expenditure on health care and because they also are only based on self-reported symptoms.

CUTTING DOWN THE DOSAGE

It is clear that reducing the dose of pesticides that workers are exposed to will significantly reduce the health costs that they have to bear. For example, a 25% reduction in the dose of the most toxic chemicals used would result in a 16% reduction in health care costs; a 25% reduction in the dose of all pesticide doses would results in a 24% reduction in these costs. If the safest pesticides replace all 'red' chemicals, costs would come down by 13%. A higher level of welfare gain(24%) is achieved if the dose of all chemicals is reduced by 25%.

SANDEE

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Author

P. Indira Devi

Editor

Rufus Bellamy

Series Editor

Priya Shyamsundar

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This policy brief is an output of a research project funded by SANDEE. The view's expressed here are not necessarily those of SANDEE's sponsors.

TABLE : MOST COMMON HEALTH SYMPTOMS ASSOCIATED WITH PESTICIDE EXPOSURE IN THE STUDY AREA (NUMBER OF CASES)

Type of sickness	Pesticide applicators during applying day	Pesticide applicators during non-applying days	Agricultural labors
Eye irritation	147	2	3
Nausea	66	1	15
Giddiness	29	2	3
Breathing problems	87	5	3
Fever	20	9	2
Vomiting	40	0	0
Cramps	29	3	0
Itching	228	5	2
Convulsions	24	0	0
Burning sensation	51	0	1
Hives	134	13	2
Diarrhea	11	0	0
Tremor	11	0	0

The study therefore recommends that the quantity of pesticide used be reduced. This can be achieved either through restricting the quantity of formulation or by increasing the dilution of the spray fluid by using water at recommended volumes.

Less than 2% of the applicators understand the toxicity levels of the pesticides they use. Thus, there is ample scope for reducing pesticide exposure through training. An extension strategy focusing on this aspect alone would result in an improvement in the health of pesticide applicators. Support could be provided by subsidizing the supply of protective gear, and by setting up general awareness-creation programs.

Given the overall economic cost of pesticide use in the region (Rs 180 million), it can be argued that it would make economic sense to invest this amount of money to improve the safety of pesticide use in Kuttanad. The State Department of Agriculture could initiate programs with this objective. The existing welfare fund board for agricultural laborers could also institute a special programme for pesticide applicators. Simultaneously, insurance protection measures for pesticide applicators could be introduced. Indeed, the results of this and other studies could be used to estimate premiums. Overall it is clear that the health impacts of pesticide misuse are not inevitable and that helping paddy workers to do their work in a way that does not harm their health would have benefits that would reach far beyond the rice field.

SANDEE | P.O.Box 8975 EPC-1056 | Kathmandu, Nepal
Tel: 977-1-552 8761, 552 6391 | Fax: 977-1-553 6786
E-mail: info@sandeeonline.org
Website: www.sandeeonline.org