Understanding the Links between Agriculture and Health

Occupational Health Hazards of Agriculture

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According to the International Labour Organization (ILO), the agricultural sector is one of the most hazardous to health worldwide. Agricultural work possesses several characteristics that are risky for health: exposure to the weather, close contact with animals and plants, extensive use of chemical and biological products, difficult working postures and lengthy hours, and use of hazardous agricultural tools and machinery. This brief outlines the occupational health hazards of agriculture, presents a case study on the trade-offs between their health and economic impacts, and proposes responses.

HEALTH AND INJURY OUTCOMES AMONG AGRICULTURAL WORKERS

The table summarizes the many occupational health hazards of agriculture. Health outcomes associated with these hazards range from relatively simple conditions like heat exhaustion to complex diseases like cancer. Exact data on levels of exposure and associated disease prevalence (or health effects) in the developing world are limited. Pesticide-related illnesses, for example, go largely underreported, though it is estimated that 2 to 5 million people every year suffer acute poisonings and that 40,000 die. Millions of injuries are known to occur, with at least 170,000 of these being fatal for agricultural workers each year. Unsafe equipment and conditions, inadequate training, and limited availability and use of personal protective equipment all contribute.

Health and injury burdens depend on the type of farming activity, the type of worker, and the geographic location. Research in India suggests that agricultural workers using powered machinery are most at risk from fatal accidents, but that injuries are actually more common in less mechanized villages, probably owing to lower adherence to safety standards. Basic hazards like sharp tools and snake bites can also cause debilitating wounds and fatalities.

Different forms of animal husbandry expose workers to different zoonotic diseases. In Malaysia, an outbreak of Nipah virus in 1998 disproportionately affected pig farmers. Workers with dairy cows and sheep in parts of Asia, Africa, and Latin America are at high risk from brucellosis, and animal herdsmen in Africa from Rift Valley Fever. There are also important differences between developed and developing countries: according to the World Health Organization (WHO), although developing countries accounted for only 20 percent of all pesticide use in the early 1990s, they accounted for more than 99 percent of poisonings, because more toxic products were used under more rudimentary conditions.

ECONOMIC IMPACTS OF AGRICULTURE-RELATED ILL HEALTH AND INJURY

Ill health arising from agricultural work has negative implications for agricultural productivity. A study of women farmers in mixed cropping systems, by the University of Benin (Nigeria), found that the vast majority suffered from intense muscular fatigue, heat exhaustion, and skin disorders, forcing them to take days off from attending to crops. In Madhya Pradesh, India, in 2000, the value of human life lost to fatal injuries in agriculture, plus the cost of nonfatal injuries, was estimated at US$27 million.

The economic costs arising from the occupational health hazards of agriculture often arise because of the economic incentives of agricultural work. A study in Carchi, Ecuador—the country's most important potato-growing zone—by a group of international scientists and the International Potato Center found that pesticides bring income gains, but overall they result in lower economic productivity owing to their health costs (see box).

RESPONSES TO HEALTH PROBLEMS IN AGRICULTURE

Rigorous evaluations of the health benefits associated with interventions to improve agricultural practices are few. Still, there are a range of opportunities for technologies and policies to substantially

Occupational Health Hazards of Agricultural Work in Developing Countries

EXPOSURE	HEALTH EFFECT	SPECIFICITY TO AGRICULTURE
Weather, climate	Dehydration, heat cramps, heat exhaustion, heat stroke, skin cancer	Most agricultural operations are performed outdoors
Snakes, insects	Fatal or injurious bites and stings	Close proximity results in high incidence
Sharp tools, farm equipment	Injuries ranging from cuts to fatalities; hearing impairment from loud machinery	Most farm situations require a wide variety of skill levels for which workers have little formal training, and there are few hazard controls on tools and equipment
Physical labor, carrying loads	Numerous types of (largely unreported) musculoskeletal disorders, particularly soft-tissue disorders, e.g., back pain	Agricultural work involves awkward and uncomfortable conditions and sustained carrying of excessive loads
Pesticides	Acute poisonings, chronic effects such as neurotoxicity, reproductive effects, and cancer	More hazardous products are used in developing countries with minimal personal protective equipment (PPE)
Dusts, fumes, gases, particulates	Irritation of the eyes and respiratory tract, allergic reactions, respiratory diseases such as asthma, chronic obstructive pulmonary disease, and hypersensitivity pneumonitis	Agricultural workers are exposed to a wide range of dusts and gases from decomposition of organic materials in environments with few exposure controls and limited use of PPE use in hot climates.
Biological agents and vectors of disease	• Skin diseases such as fungal infections, allergic reactions, and dermatoses	• Workers are in direct contact with environmental pathogens, fungi, infected animals, and allergenic plants
	• Parasitic diseases such as schistosomiasis, malaria, sleeping sickness, leishmaniasis, ascariasis, and hookworm	• Workers have intimate contact with parasites in soil, wastewater/sewage, dirty tools, and rudimentary housing
	• Animal-related diseases or zoonoses such as anthrax, bovine tuberculosis, and rabies (at least 40 of the 250 zoonoses are occupational diseases in agriculture)	• Workers have ongoing, close contact with animals through raising, sheltering, and slaughtering
	• Cancers, such as bladder cancer caused by urinary bilharzia contracted through working in flooded areas in North and Sub-Saharan Africa	• Agricultural workers are exposed to a mix of biological agents, pesticides, and diesel fumes, all linked with cancer

Pesticides, Health, and the Economics of Potato Production in the Highlands of Ecuador

In Carchi, Ecuador, potato growers—mainly smallholders—use hand-pump backpack sprayers to apply high levels of highly toxic pesticides to their crops to fight Andean weevils and late blight fungus. The acute and chronic health effects are severe. In the late 1990s, researchers documented 171 pesticide poisonings per 100,000 people per year in Carchi—among the highest rates reported in the world. Pesticide poisoning was the second largest cause of death for men (19 percent) and fourth for women (13 percent).

Chronic health effects of pesticides were equally severe. The standardized average neurobehavioral score of potato-growing households was nearly 1 standard deviation below the control population. Individual tests indicated that up to two-thirds of these household members showed significant nervous system impairment, enough to cause difficulties in carrying out physical tasks and making farm management decisions.

The problem was traced to incorrect pesticide use: more than 70 percent of men and 80 percent of women did not understand the color coding on pesticide labels indicating toxicity, despite a near 90 percent literacy rate and substantial industry education on "safe use." Farmers made minimal use of protective clothing during pesticide preparation and application, and many failed to shower off pesticide residues or change their clothes immediately after application. Farm families stored pesticides in their homes and washed their application equipment and clothing nearby. As a result, their homes were widely contaminated with toxic pesticides.

In economic terms, the farmers' heavy use of pesticides offered a positive marginal benefit: an additional dollar spent on pesticides generated more than one additional dollar of income. The severe health impacts, however, reduced farmers' work capacity and production. The immediate cost of a typical poisoning (related to medical care, medicines, travel, and days of recuperation) was valued at about 11 days of lost wages. Econometric analysis also showed that farmers who had suffered significant neurobehavioral impairment were less productive than those not affected. So the economic benefits from using the pesticides were outweighed by the economic losses created by negative health impacts.

In Carchi, several policy options have been examined to reduce the health effects of pesticides, each with their benefits and problems. One option, education for safe use, focuses heavily on the use of costly or ineffective personal protective equipment, but has not prevented even the most literate and educated farmers from using pesticides in an unsafe way. Econometric analysis has shown that taxing highly toxic pesticides would improve both farmer health and profitability in Carchi, but the option lacks political feasibility. Stakeholders attending provincial and national-level meetings in Carchi suggested banning highly toxic pesticides—the most effective solution from a health perspective but one opposed on economic grounds. Overall, the best option appeared to be integrated pest management (IPM). In farmer field school experimental plots, farmers tested simple IPM technologies that substantially reduced costs while maintaining yields, leading to increased profitability. The returns on investment ranged from 120 to 145 percent. Farmer networks are now slowly spreading this option through highland communities.

Source: Adapted from Yanggen et al. 2003.

reduce the health-related burdens of working in agriculture. Different hazards require different solutions. In general, if occupational health hazards are to be addressed, greater organization and empowerment of the agricultural workforce and small farmers is needed. The International Federation of Plantation and Agricultural Workers advocates for better working and living conditions for agricultural wage workers, while numerous nongovernmental organizations and some national governments work with small farmers to reduce risks.

Giving workers a voice in determining working conditions can make a difference. For example, community monitoring convinced donors to stop providing toxic pesticides to World Bank–funded projects in the Philippines. Regulations and codes of conduct that do exist also need to be enforced, such as the ILO and WHO guidelines for reducing hazards in agricultural work and providing occupational health services to agricultural workers.

To effect change, the agriculture and health sectors should work together more closely. The agricultural sector should develop and build on ways of working with farmers to grow crops that promote healthier cultivation practices and reduce exposure to hazards. Health-sector staff, meanwhile, should document health problems and identify the greatest hazards, help explain the health reasons for such changes, and monitor changes in health with improved production methods. ■

For further reading see R. K. Egharevba and F. A. Iweze, "Sustainable Agriculture and Rural Women: Crop Production and Accompanied Health Hazards on Women Farmers in Six Rural Communities in Edo State Nigeria," *Journal of Sustainable Agriculture* 24, no. 1 (2004): 39–51; M. A. El Batawi, *Health of Workers in Agriculture* (Cairo: WHO Regional Office for the Eastern Mediterranean, 2004); International Labour Organization, *Safety and Health in Agriculture*, Report VI (1) (Geneva, 1999); F. Konradsen, W. van der Hoek, D. C. Cole, G. Hutchinson, H. Daisley, S. Singh, and M. Eddleston, "Reducing Acute Poisoning in Developing Countries: Options for Restricting the Availability of Pesticides," *Toxicology* 192, nos. 2–3 (2003): 249–61; D. Yanggen, D. Cole, C. Crissman, and S. Sherwood, "Human Health, Environmental, and Economic Effects of Pesticide Use in Potato Production in Ecuador," Research Brief (Lima, Peru: International Potato Center, 2003); and P. S. Tiwari, L. P. Gite, A. K. Dubey, and L. S. Kot, "Agricultural Injuries in Central India: Nature, Magnitude, and Economic Impact," *Journal of Agricultural Saftey and Health* 8, no. 1 (2002): 95–111.

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