# focus H The two-way links between agriculture and health

*Agriculture can pose major threats to health through increased incidence of malaria linked to irrigation, pesticide poisoning, and diseases transmissible from farm animals to humans in intensive livestock systems. And some of the developing world's major health problems, such as AIDS and malaria, can have disastrous effects on agriculture, through the loss of labor, knowledge, and assets. So coordinating agriculture and health interventions can yield significant welfare benefits for the poor in developing countries.*

Agriculture affects health, and health affects agriculture. Agriculture supports health by providing food and nutrition for the world's people and by generating income that can be spent on health care. Yet agricultural production and food consumption can also increase the risks of water-related diseases (malaria) and foodborne diseases—as well as health hazards linked with specific agricultural systems and practices, such as infectious animal diseases (avian flu, brucellosis), pesticide poisoning, and aflatoxicosis.[1]

Illness and death from AIDS, malaria, tuberculosis, and other diseases reduce agricultural productivity through the loss of labor, knowledge of productive adults, and assets to cope with illness. Because the majority of the world's poor work in agriculture and the poor suffer disproportionately from illness and disease, taking an integrated view of agriculture and health is necessary to address poverty and promote agriculture for development.

The lack of coordination of policy making between agriculture and health[2] undermines efforts to overcome ill health among the rural poor and gives short shrift to agriculture's role in alleviating many of the world's most serious health problems. Considered here are malaria, pesticide poisoning, AIDS, and diseases transmitted from animals to humans. The important link through food security and nutrition is discussed elsewhere (focus C).

## Malaria

Every year an estimated 300 to 500 million people get sick from malaria, and more than 1 million die from it, many of them children.[3] Characteristics of agricultural production systems, such as crop rotation, the presence of livestock, and the proximity of villages to fields and water sources, affect malarial risk. In particular, irrigation can create conditions that favor parasitic vectors and facilitate disease transmission.[4] In Ethiopia researchers found malaria prevalence to be higher in those villages close to government-promoted micro dams.[5] But in Tanzania malaria was less prevalent in irrigated areas, where rice-growing improved incomes so that farm households could afford insecticide-treated nets.[6]

The impact of malaria on agricultural productivity has a long history. In the first half of the 20th century it was the leading public health problem in Italy, much as in many developing countries today. Absences resulting from illness and death were common during the agricultural season, leaving millions of hectares of Italy's most fertile land fallow.[7] In the developing world malaria continues to have serious negative impacts on productivity. One study of farmers engaged in intensive vegetable production in Côte d'Ivoire showed that malaria sufferers produced about half the yields and half the incomes that healthy farmers did.[8]

Malaria can be controlled by modifying or manipulating agricultural water systems. In the early 1900s better maintenance and improvements of irrigation and drainage systems reduced malaria cases by more than half in the Arab Republic of Egypt, India, and Indonesia.[9] A case study in India in 1940–41 showed that intermittent irrigation of rice fields reduced malaria contraction from 48 percent to 4 percent. Today, there are many options to mitigate the negative effects of irrigation while maintaining agricultural productivity. They include providing location-specific knowledge of drainage techniques, intermittently wetting and drying rice fields, alternating rice with a dryland crop, and using livestock as "bait" for mosquitoes.[10]

## Pesticide poisoning

Pesticides can increase agricultural productivity, but when handled improperly, they are toxic to humans and other species. In addition to food safety concerns, unintentional poisoning from exposure kills an estimated 355,000 people each year, two-thirds of them in developing countries.[11] Costs of medical treatment, lost labor, and lower long-term productivity can be high.

Many farmers in developing countries overuse pesticides and do not take proper safety precautions because they do not understand the risks and fear smaller harvests. Making matters worse, developing countries seldom have strong regulatory systems for dangerous chemicals: Pesticides banned or restricted in industrial countries are used widely in developing countries.[12]

Farmer perceptions of appropriate pesticide use vary with the setting and culture. It is common in Latin America for farmers to believe that exposure to pesticides increases their tolerance and makes them stronger and more able to work, often leading to very high exposure. In a potato-farming community in Carchi, Ecuador, researchers documented 171 pesticide poisonings per 100,000 people per year in the late 1990s—among the highest in the world. Pesticide poisoning there was the second largest cause of death for men (19 percent) and fourth for women (13 percent). The high health care costs and lost work time outweighed the benefits of pesticide use. Farmers who focused on naturally preventing or suppressing pests and used pesticides only when necessary substantially reduced exposure while maintaining yields and increasing profitability.[13]

In the Philippines in 1989–91 farmers commonly applied two insecticide doses[14] per growing season, elevating their health costs by an average of 70 percent above those who did not use pesticides. The yield benefits from pesticide use were more than offset by the cost of illness.[15]

To limit the health and economic costs of pesticide use, policy makers can finance training and information campaigns and reduce accessibility to the more dangerous agrochemicals through banning or taxing their use. Natural control and integrated

pest management also show promise. In Nicaragua farmers trained in appropriate pesticide use suffered lower exposure after two years and had higher net returns than did those not trained.[16]

## HIV and AIDS

In 2006 an estimated 39.5 million people in the world were living with HIV, and an estimated 2.9 million people died from AIDS.[17] The majority of people affected by HIV and AIDS depend on agriculture, and their livelihoods are undermined by the disease in many countries. In many Sub-Saharan countries AIDS demands a rethinking of development policies, and parts of South Asia may face similar situations if the epidemic continues unabated.[18]

Illness and death from HIV and AIDS reduce agricultural earnings and productivity. A 1997 study of worker productivity in a Kenya tea estate found the average daily output of HIV-positive workers to be 23 percent less than that of healthy workers in the same fields.[19] A study of rural households in Mozambique showed that a household that suffered an adult male illness or death likely to be HIV-related experienced a significant reduction in food production, relative to other categories of households. This represents a major shock for households relying on subsistence production and already far below their recommended food intake (figure H.1).

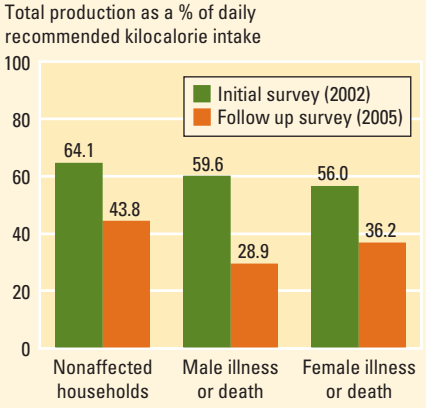
HIV/AIDS also reduces the capacity of the agricultural civil service. Between 1996 and 2000 in Kenya, 58 percent of all deaths of staff in the Ministry of Agriculture were AIDS-related.[20] And Mozambique's Ministry of Agriculture projects that it may lose 20–24 percent of its staff to HIV/AIDS from 2004 to 2010.

Lower agricultural earnings and productivity can also increase the risk of contracting HIV. Facing insecure livelihoods, some household members migrate to find work or engage in transactional sex. Many studies show a significant correlation between HIV prevalence and migration, suggesting that mobility increases the probability of risky behavior. [21]

There is tremendous scope for agricultural policy to become more HIV-responsive and further both health and agricultural goals. Promoting labor-saving technologies and crops is one way to address lost labor resulting from AIDS-related mortality in agriculture. But for poorer smallholder households, the main constraints on livelihoods may be land and cash rather than labor. So cash transfers to help them hire labor, more secure land tenure for women, and expanded agricultural extension programs to include women and orphans could have a greater impact on welfare.[22]

Targeted programs can capitalize on the links between AIDS and agricultural livelihoods. To overcome the lack of land and labor often facing AIDS-affected households, the Livelihoods Recovery through Agriculture Programme, implemented in Lesotho in 2002 by CARE and the Ministry of Agriculture, promotes producing crops with high nutritional content on small plots of land close to the home. Of the participants, 53 percent reported that they had stabilized or increased their food production.[23] Another program in Mozambique provides orphans and vulnerable children in high HIV-prevalence areas with crucial farming and life skills as well as nutritious daily meals. Similar programs are being tested in Kenya, Namibia, Swaziland, and Zimbabwe.[24]

**Figure H.1 Staple food production declines after an AIDS-related illness or death in Mozambique**




*Source:* Data from Donovan and Massingue (2007) comparing the kilocalorie production of households affected by an adult illness or death, likely to be AIDS-related, with unaffected households in rural Mozambique.
*Note:* Because these are subsistence farmers, production can be used as a measure of consumption. Percent daily recommended kilocalorie intake equals the median home production (kcal/day/adult equivalent) divided by the recommended consumption (3,000 kcal/day/adult equivalent).

## The rise of zoonotic disease threats

The livestock revolution in developing countries has been associated with the growth of unprecedented concentrations of animals in the urban and periurban areas of developing countries, with major implications for human and animal health. Of 1,415 species of infectious organisms known to be pathogenic to humans, 61 percent are zoonotic, or transmissible from animals to humans. And of the 175 pathogenic species of infectious organisms considered to be "emerging" (or reemerging) in humans, 75 percent are zoonotic.[25] The poor are especially exposed because of the proximity of their living spaces to farm animals.

Zoonotic diseases of significance in developing countries fall into three categories based on the form of transmission: foodborne (cysticercosis, brucellosis, tuberculosis), infectious (avian influenza, tuberculosis), and vector-borne (rabies or trypanosomosis).

Animal disease has long been a major economic issue. The losses from animal deaths from the H5N1 strain of highly pathogenic avian influenza and the costs of controlling it run into the tens of billions of dollars. Since late 2003 the H5N1 strain of avian influenza has been responsible for 4,544 documented outbreaks in poultry in 36 countries, associated with 269 human cases and 163 fatalities (as of January 2007). The virus is not easily transmitted to and within humans. But the great concern is that it could mutate within either animal or human hosts to become easily transmissible from humans to humans, raising the possibility of a disastrous pandemic.

The primary method of controlling animal diseases is to quickly cull diseased animals and others they may have come in contact with, reducing the viral load. Vaccinations are expensive and difficult to implement under developing country conditions.[26] So controlling zoonotic disease in the animal vector is critical.[27] The key is to respond quickly and comprehensively once the disease appears in animals.[28] This requires not only trained technicians but also incentives to reveal and cull diseased animals.