

Food Safety, Plant and Animal Health: Human Health and Sustainability Dimensions

In order to help meet development and sustainability goals, food must be safe and wholesome to consume. Effective, coordinated and proactive national and international food safety systems can improve plant, animal and human health. Agricultural knowledge, science and technology (AKST) can play an important role when used within effective regulatory frameworks with sufficient resources.

Among the requirements for achieving human health and sustainability goals are greater investments in adequate food safety infrastructure, public health and veterinary capacity; legislative frameworks for identification and control of biological and chemical hazards; and farmer-scientist partnerships for identification, monitoring and evaluation of risks. The agricultural component of bilateral assistance for developing countries grew 16% in 1985, but had declined to 4% by 2003. Recently, however, there has been a renewed interest among donors to use agriculture to promote economic growth and poverty reduction.

Challenges

Human health

Foodborne disease is estimated to affect 30% of the population in industrialized countries at some time in a given year. In developing countries, foodborne disease accounts for an estimated 2.1 million deaths annually. Significant under-reporting leads experts to estimate that the incidence of foodborne disease may be substantially higher than the number of cases reported worldwide. About 50% of the health burden of malnutrition has been attributed to poor water, sanitation and hygiene, including food hygiene.

In developing countries, foodborne diseases can cause or exacerbate malnutrition. Together foodborne diseases and malnutrition cause an estimated 12 to 13 million child deaths annually; survivors are often left with impaired physical and/or mental development. Of the approximately 200 infectious foodborne diseases emerging in both high and low income countries, 75% are zoonotic (transmitted between humans and animals).



Wheat stem rust. Source: USDA.

Plant and animal health

Plant disease can be devastating for human health, both directly, if plant toxins are consumed, and indirectly, if plant disease results in crop loss and subsequent malnutrition. For example, the yield loss to wheat crops from one race of wheat stem rust (Ug99) typically ranges from 40 to 80%, with some instances of complete crop failure. Some long-standing plant health problems, such as mycotoxins

and ergotism, continue to add significantly to the health burden, especially of infants, and cause widespread problems with basic foodstuffs. Particularly vulnerable to these problems are the world's approximately 850 million people who are not able to obtain sufficient food to lead healthy and productive lives.

Pathogens evolve both in terms of their prevalence and severity for human health. Pathogens featured in today's headlines, such as *Listeria monocytogenes* or *E. coli* 0157:H7, were not identified as major causes of foodborne illness 20 years ago. Fortunately, the majority of foodborne illnesses in most countries are caused by only a few pathogens, e.g., *Salmonella* and *Campylobacter* accounted for about 96% of the reported zoonoses cases in the European Union in 2005. For most foodborne infections, effective preventive interventions can be made despite a lack of comprehensive epidemiological knowledge.

Food safety

Sources of food contamination may be either microbiological or chemical and may occur throughout the food chain, from the farm to the table. For example, many countries have experienced an increased risk of *Salmonella* contamination in soy meals, which constitutes an important route for introducing *Salmonella* into animal production when used as animal feed. Foodborne illnesses caused by chemicals are sometimes difficult to link to a particular food; the onset of the effects may be gradual and not be detected until chronic or permanent damage occurs. Food poisonings can also be acute, with immediate adverse effects including death, such as those caused by organophosphate pesticides.

Food safety programs attempt to control the consumption of agrochemical residues, growth hormones, additives and naturally occurring toxins (e.g., aflatoxins) in foods by setting and enforcing Maximum Residue Levels for individual chemicals based on assessments of the risks that the chemicals pose to human health.

Chemical use in food production has increased worldwide. For example, in constant dollars, global expenditures on agricultural pesticide imports, summed across all nations of the world, have increased more than 1000% since 1960. Faced with rising chemical use in many countries, food safety programs have introduced Good Agricultural Practices to diminish harm to human health. However, coordination problems among different ministries involved in such programs and reluctance to pay for on-farm food safety measures often impede successful realization of the programs.

Additionally, private sector sanitary and phytosanitary (SPS) standards can result in market discrimination against resource-poor farmers who cannot afford the high cost of participation in programs that certify compliance with the standards needed to enter international markets and some domestic markets.



Avian influenza control. Source: FAO.

Surveillance systems

The timeliness and efficacy of preventative food safety, animal health or plant health interventions depend on accurate, comprehensive and up-to-date surveillance information. For countries with weak surveillance and outbreak detection systems, estimating the burden of foodborne illness is daunting, despite the assistance provided by the WHO, FAO and the World Animal Health Organization (OIE).

Climate change is likely to further complicate foodborne disease surveillance and prevention as new pathogens emerge, e.g., in fish and shellfish raised

in degraded or contaminated water. Climate change also can affect plant health in numerous ways, for example, by modifying the encounter rate between pest and host plant; changing the ranges of the two species; introducing new pests; and shifting land use patterns. Action to mitigate the impacts of climate change on crop production and plant health will require integrated strategies developed and implemented with farmer participation. This participation should emphasize inclusion of non-traditional actors in agricultural research designed to meet the plant and animal health, as well as food safety needs of small-scale producers and poor consumers. To date, funding for adaptive research and pre-extension services remains far too low to effectively address these issues.

International regulatory frameworks

The management of food safety, plant and animal health from the farm to the table requires coordination and integration that are often not provided by the current international policy and regulatory framework. International public standards are developed by the Codex Alimentarius Commission, the World Animal Health Organization and the International Plant Protection Convention. These standards and related SPS measures are implemented and enforced to a greater or lesser degree,

depending on available resources, through an array of often uncoordinated national initiatives managed by various ministries in different countries.

Although most agricultural products are not traded internationally, national agricultural planning and AKST investment is increasingly oriented towards export markets and designed to comply with international trade rules. In theory, trade related SPS standards and control measures may also be applied readily to domestic SPS programs. In practice, developing countries adopt few international standards into domestic legislation because they lack the resources and technical capacity for implementation and enforcement. The cost of meeting private international standards, such as those overseen by the Global Food Safety Initiative, is borne by primary producers. There are few studies that quantify infrastructural and compliance costs of international public and private standards implementation and enforcement.

Animal health and welfare issues

Global warming, which results in vectors and diseases moving into new areas, the BSE ('mad cow') crisis, and the avian influenza pandemic have highlighted the importance of the animal-human link in the food chain and the need for capacity building for surveillance and control of zoonotic diseases.

Estimated global burden of infectious animal diseases. Source: M. Wierup and K. Ebi.

Classification of infectious animal diseases	Qualitative estimation of relative number	Qualitative estimation of relative cost and importance for major stakeholders			
		Public sector cost		Producer cost	
		Animal health	Public health	Developed countries	Developing countries
Major epizootics ¹	+	+++++	-	- ²	++
Other major diseases ³	++	+++	+++	++	++
Endemic and neglected diseases ⁴	+++++	+	+++++	+++++	+++++

¹ Those reportable to OIE

² Diseases eradicated or absent. Elimination policy applied in case of outbreaks when significant costs may occur.

³ Transmissible from animals to humans

⁴ Not transmissible to humans

Despite remarkable technical advances in the diagnosis, prevention and control of animal diseases, the condition of animal health throughout the developing world remains generally poor, causing substantial economic losses and hindering any improvement in livestock productivity.

Policies that contain economic incentives are needed for improving hygiene in animal production in order to limit pathogen entry into the food chain. Economic compensation in the case of outbreaks, surveillance and other measures are generally limited to zoonotic diseases. The economic importance of endemic diseases (not transmissible to humans) is also widely recognized and in many developed countries a number of endemic diseases have been eradicated or controlled (e.g., bovine virus diarrhoea). In addition to efforts to minimize the negative effects of the major epizootic diseases and food-borne diseases, policy and investment could focus on the prevention and control of endemic diseases.

Sustainable extensive livestock production practices in developing countries that promote animal welfare could open niche market opportunities in developed countries. Implementation of veterinary policies, such as risk and commodity-based approaches, which permit trade in animals and animal products even if a specific major disease is not eradicated, can help create market entry for unaffected products.

Plant health issues

Plant pests are key constraints to achieving the yield potential of crops, particularly in tropical and sub-tropical regions where conditions conducive to pest reproduction may be present year-round. Core services of traditional plant protection and quarantine (PPQ) programs include detection and control or management of plant pests of economic significance; undertaking pest risk analyses; and managing import, export and/or domestic certification programs. These programs are being financially

strained by increases in the volume and kinds of agricultural products being traded internationally, the number of countries exporting such products and international travel, which creates more opportunities for the rapid introduction and spread of new pest species.

National, bilateral and international support for the establishment of biosafety regulatory programs to conform with the Cartagena Protocol on Biosafety has favored the creation of new regulatory entities under ministries other than agriculture. New resources for biosafety regulatory capacity building may be applied to strengthen existing PPQ programs so that the objectives of both can be achieved without building redundant administrative services. This could be achieved under the umbrella of “plant biosecurity” to include plant health, plant biosafety and also invasive alien species.

National prioritization of the needs of resource-poor farmers may be more important in the future if the extent of scientific and agricultural technology spillovers from developed to developing countries decreases. Governments may wish to align public sector AKST funding to support research explicitly directed to improving small-scale, diversified farming practices that promote improved yields and enhanced food safety through sustainable pest management practices. Plant protection options that successfully manage pest populations and minimize the adverse human health impacts sometimes associated with synthetic pesticides include increasing institutional and policy support for—and investment in—participatory, agroecologically-based pest management research, extension and education.

Policy options

- Strengthen or initiate regional foodborne, animal and plant health surveillance systems, particularly among countries whose national circumstances, including dietary patterns, agri-

cultural practices and agricultural resource base, are similar.

- Establish regional or national food safety trust funds to ensure continuous funding mechanisms for national or regional surveillance systems. The trust funds could be financed from targeted Overseas Development Assistance and/or an increase in agrifood corporate taxes. This funding instrument would lessen the need for governments to respond ad hoc to food safety emergencies or SPS related threats to trade. Ad hoc responses are both less effective and more expensive than preventive measures. (These responses are often financed by UN voluntary funds raised for each purpose.)
- Expand current “aid for trade” commitments by WTO member governments to include the financing of specific SPS infrastructure requested by members with documented incapacity to finance from domestic sources. Capacity building should be redirected from training on SPS rules to technical support needed to operationalize SPS surveillance and intervention programs. Since it is unlikely that governments will support binding and enforceable “aid for trade” commitments, governments should consider developing a model contract for expedited needs assessment that is not tied to import of SPS technology and training from any one donor.
- Provide increased international support for SPS measures that focus on domestic plant and animal health, food safety and public health. Currently SPS standards are often selectively implemented in developing countries for the purpose of trade facilitation, often with little benefit to local consumers of domestically produced food.
- Support veterinary services in developing countries, such as those in ongoing initiatives by the World Animal Health Organization, to improve food safety and secure the national

food supply. Policies that recognize and support the training of para-professionals, such as community animal health workers, could be promoted to compensate for the limited availability of public health veterinarians.

- Align government public sector investment to support AKST that helps producers meet statutory SPS standards through agricultural research, extension and/or education systems.
- Strategically invest in public funds for AKST designed to promote the participation of small-scale farmers in third-party (neither the government nor company) certification to comply with private SPS standards through the provision of education programs and technical assistance.
- Establish an intergovernmental or UN task force to generate recommendations for member governments to utilize surveillance and intervention systems to identify SPS risks and hazards that may result from anticipated effects of climate change on agricultural production and distribution.



Source: FAO/Marco Longari



The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) provides information on how agricultural knowledge, science and technology can be used to reduce hunger and poverty, improve rural livelihoods and human health, and facilitate equitable environmentally, socially and economically sustainable development. The full set of IAASTD reports includes a Global and five sub-Global reports and their respective summaries for Decision Makers as well as a Synthesis Report, including an Executive Summary. The reports were accepted at an Intergovernmental Plenary in Johannesburg in April 2008.

The assessment was sponsored by the United Nations, the World Bank and the Global Environment Facility (GEF). Five UN agencies were involved: the Food and Agriculture Organization (FAO), the UN Development Program (UNDP), the UN Environment Programme (UNEP), the UN Educational, Scientific and Cultural Organization (UNESCO) and the World Health Organization (WHO).

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