INSPECTION, QUARANTINE AND QUALITY CONTROL

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Summary

With the expansion of the agricultural trade, plant and animal disease prevention and control and the protection of food safety are fundamentally international problems. Governments are faced with a policy trade-off: how do they maintain and expand gains from international trade while limiting trades external costs, in the form of the spread of disease or other undesirable environmental outcomes?

To establish common international norms for regulations to protect plant, animal, and human health, countries and international bodies are increasingly relying on risk analysis procedures. While the use of quantitative risk assessments to support rulemaking and to resolve trade disputes over SPS issues is relatively new, there is some limited evidence of favorable assessments allowing countries to expand export markets.

In the future, the operation of international inspection systems will face a number of challenges. One issue is the cost of implementing inspection systems and complying with international norms. Another problem is coping with the scientific uncertainty inherent in the management of longer-term and highly uncertain risks. The proliferation of novel food products and, with biotechnology, novel plant and animal genotypes, combined with continued expansion of international trade, imply increasing complexity and change in the global system of the distribution of plants, animals and foods.

1. Introduction

Inspection, quarantine and quality control measures are used as policies to protect against the spread of disease from crop to crop, animal to animal, and from animals and food to humans. While there are economic gains from specialization in production and expanded trade in food and agricultural commodities, the spread of plant and animal disease is a significant external cost of trade. Due to externalities and problems of imperfect information associated with plant and animal health and disease, there is scope for market failure in the provision of health services. In response, governments, for centuries, have been involved in animal quarantines and disease eradication, often through animal slaughter (see *Veterinary Public Health: An Historical Perspective*). Over time, inspection has been increasingly used, both as a regulatory tool, and as an information gathering and health surveillance tool.

To establish common international norms for regulations to protect plant, animal, and human health, countries and international bodies are increasingly relying on risk analysis procedures (see *International Policies to Control Plant and Animal Diseases* and *International Food Inspection*). Risk analysis proceeds in three distinct stages: risk assessment, risk management and risk communication (discussed below). While the use of quantitative risk assessments to support rulemaking and to resolve trade disputes over SPS issues is relatively new, there is some limited evidence of favorable assessments allowing countries to expand their export markets (see chapter *International Policies to Control Plant and Animal Diseases*).

With expanding agricultural trade, plant and animal disease prevention and control and protection of food safety are fundamentally international problems. Governments are faced with a policy trade-off: how do they maintain and expand gains from international trade while limiting trades external costs in terms of the spread of disease or other undesirable environmental outcomes? A number of international institutions and agreements have evolved to address this trade-off. These include the Office International des Epizooties (OIE) (animal health), the International Plant Protection Convention (IPPC) (plant health), the Codex Alimentarius Commission (food safety), the Sanitary and Phytosanitary (SPS) Agreement of the World Trade Organization (WTO), and the Cartagena Protocol on Biosafety (agricultural biotechnology and genetically modified food products).

As regulations to prevent and control disease often restrict transportation and mobility of products, they act as technical barriers to trade. This raises the question of whether particular technical barriers are put in place to protect plant, animal and human health, or whether they are being misused as a disguised, non-tariff form of protectionism. The

SPS Agreement addresses this issue most directly, while the other international institutions provide crucial data and information that inform debates over specific trade policies of particular economies.

2. The Nature of the Problem

An externality occurs when producers or consumers do not bear the full cost (or receive the full benefit) from the harm (or good) their actions bring to others. Pollution is a common example of a negative externality, as is the transmission of disease or pests from one set of plants or animals to others. Through agricultural production and trade, pests and diseases are also transferred. Those benefiting from that production and exchange do not bear the full cost of the spread of pests or disease. As noted in *Veterinary Public Health: An Historical Perspective*, infection may be thought of as "the ultimate externality – it cannot be internalized in an animal, in a herd or within a country without adequate control mechanisms." Also, because collective maintenance of plant and animal health is a public good, individual agents will have an incentive to free ride (i.e. not contribute fully health prevention and disease control).

A most basic way of preventing the spread of diseases and pests is to restrict their movement. For this reason, the practice of quarantine – the isolation of plants and animals harboring pests and disease (or believed to) – has been a fundamental means of disease and pest control for centuries (see *Veterinary Public Health: An Historical Perspective*). With quarantine, mass destruction of diseased plants and animals, or plants and animals within proximity to diseased population has been, and remains, a crucial disease control policy. Limiting movement of plants and animals for disease and pest control inherently means restrictions on commerce. As pests and disease do not recognize national boundaries, sanitary and phytosanitary controls are *de facto* trade policies.

Externalities and public goods problems mean there is a propensity for market failure. Private actors may not demand or supply a socially desirable level of plant and animal disease control. Historically, governments have been actively involved in quarantine, destruction, inspection, and vaccination programs. The international dimension of the problem also calls for government-to-government coordination.

2.1. Plant to Plant Transmission

More than 240 crops or plant species are prohibited entry into one or more countries. Worldwide, more than 1 600 pests or pathogens are subject to quarantine and over 8 000 plants are listed as weeds. In the United States alone, more than 1 300 pests and pathogens have been identified as significant threats to crops. Major pests and pathogens threatening agriculture introduced to North America from other continents include chestnut blight, white pine blister rust, Dutch elm disease, Mediterranean fruit fly, European corn borer, gypsy moth, cotton boll weevil, and Johnson grass. Cassava bacterial blight was introduced to Africa and Asia from tropical America.

The economic costs of the spread of plant pests and disease can be substantial (see *International Policies to Control Plant and Animal Diseases* for more detailed discussion). In the United States, pests and disease cause crop losses on the order of $34 billion. In the 1940s, nursery stock infected with tristeza disease was inadvertently transferred to Argentina and Brazil, ultimately leading to the loss of 20 million citrus trees. The possibility of plant to plant transmission of disease is a cost that limits the net benefits of agricultural trade. It also imposes constraints on the exchange of plant genetic materials used in international plant breeding programs.

2.2. Animal to Animal Transmission

Outbreaks of animal diseases can have devastating effects on livestock sectors of economies (see *International Policies to Control Plant and Animal Diseases*). Some examples illustrate the scope of the problem. The outbreak of rinderpest led to the destruction of half the cattle in France from 1710 - 1714. More recently, the 1997 hog cholera outbreak in the Netherlands led to the destruction of 11 million animals and cost $2 billion. As a result of the 1997 foot and mouth disease (FMD) outbreak in Taiwan, over 184 000 pigs died from the disease, 3.85 million were slaughtered as part of the eradication campaign, and the domestic price of pigs fell by 75 percent. Prior to the outbreak, Taiwan had been the world's third largest exporter of FMD-free pork.

Besides imposing externalities on other livestock producers, animal disease has the potential to impose significant external costs on other sectors of the economy. One example is the outbreak, in 2001, of foot and mouth disease (FMD) disease in the United Kingdom. FMD is a virus that affects cattle, sheep, and other cloven-hoofed animals. The disease can spread through contact or through the air and be transmitted up to 60 km over land. One policy response to the recent epidemic of FMD in Great Britain was the mass slaughter of infected animals and animals within proximity to affected herds. In addition, significant restrictions were placed on human mobility in the British countryside. These travel and movement restrictions affected British tourism and leisure industries. Some early estimates of the cost of FMD to the British economy were £9 billion (about one percent of GDP), with nearly 60 percent of the total losses felt in the tourism and leisure industries.

The costs of outbreaks have both short-term and longer-term components. In the short-term, are reductions in sales revenues, reductions in herd size (a depletion of the biological capital stock), and expenses for destruction and other disease control measures. Aside from these immediate impacts, countries also lose their status of being "disease free." A country's trading rights and access to foreign markets is often contingent on maintaining "disease free" status. Once an outbreak occurs, countries must expend substantial resources to be once again recognized as disease free. These demonstration costs and loss of international markets in the interim are longer-term costs of disease outbreaks.

2.3. Animal to Human Transmission and Food Safety

Livestock production and the consumption of animal products can lead to the transmission of disease to humans in various ways. Domestication of animals brought them, their wastes, and their diseases in closer proximity to human populations. Animal-based food products are also susceptible to disease and spoilage that can be readily transmissible to humans. Waste products from animal slaughter are another source of disease without proper disposal.

Due to these various factors, maintenance of animal health and hygiene in processing, transport and disposal of animal products has long been recognized as central to maintaining human public health (see *Veterinary Public Health: An Historical Perspective*).

Foodborne diseases are caused by ingesting bacteria, fungi, parasites, or viruses through contaminated food or water or through person-to-person contact. The U.S. Department of Agriculture (USDA) estimates that microbial pathogens cause up to 76 million cases of foodborne disease and 5 200 deaths the United States. The USDA estimates five major pathogens (campylobacter, salmonella (nontyphoidal serotypes only), *E.coli* O157 and non-O157 STEC, and *Listeria monocytogenes*) alone impose costs of $6.9 billion annually in medical costs, productivity losses from missed work, and the costs of premature deaths.

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Biographical Sketches

Jimmye S. Hillman is professor emeritus of agricultural and resource economics at the University of Arizona. In 1982 he was elected a Fellow of the American Agricultural Economics Association. His early post-WW II work on agricultural trade policies led to research on nontariff barriers [NTBs] in agricultural trade. His book “Nontariff Agricultural Trade Barriers” (1978, U. of Nebraska Press) was among the first major studies of the NTB issue. Many publications followed over the next two decades including “International Trade and Agriculture: Theory and Policy” [Senior Editor] (1979, Westview Press) and “Technical Barriers to Agricultural Trade (1991, Westview Press) that demonstrated the acute nature of agricultural protection worldwide. He was among the first to recognize the linkage between regulations governing genetically modified organisms [GMOs] and NTBs and their emergence as major protection device in world agriculture.

George Frisvold is an associate professor of agricultural and resource economics at the University of Arizona. He was formerly, Chief of the Resource and and Environmental Policy Branch of USDA’s Economic Research Service. His research interests include domestic and international environmental policy, as well as the causes and consequences of technological change in agriculture. In 1995-96 he served on the senior staff of the President's Council of Economic Advisers with responsibility for agricultural, natural resource, and international trade issues. With Betsey Kuhn, he edited the collected volume “Global Environmental Change and Agriculture: Assessing the Impacts” (1999, Edward Elgar), which examines global environmental constraints on sustained agricultural growth.