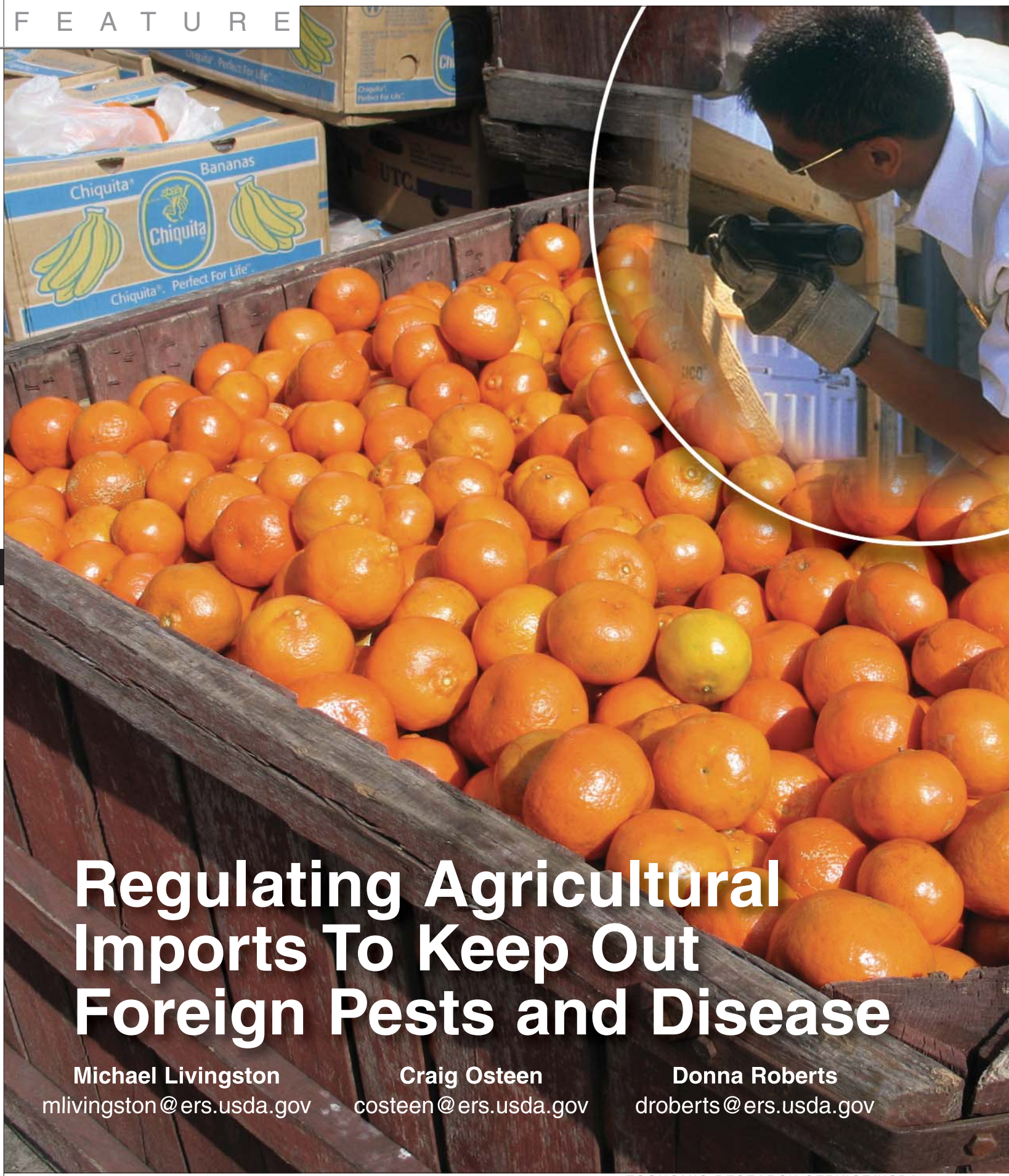


# Regulating Agricultural Imports To Keep Out Foreign Pests and Disease

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- Increasing agricultural imports benefits U.S. consumers, but shipments can transport harmful foreign pests and diseases.
- The United States and other nations use a number of approaches to reduce risks to agriculture and the environment from pests and diseases entering through trade.
- Economic analysis can help identify measures that mitigate risks of economic or environmental damage with minimal impact on trade benefits.

Increased trade helps meet U.S. consumers' growing demand for a variety of fresh and processed foods. Imports rose from 4.7 percent of the total value of U.S. food and beverage consumption in 1995 to 6.8 percent in 2005. The import share of certain categories of foods has grown much faster. For example, ERS calculates that the import share of the value of domestic consumption of fruit increased from 23.3 percent in 1995 to 32.5 percent in 2005; the share for vegetables rose from 13.9 to 24.9 percent. Growth in imports of fresh produce and other imported foods can lower costs, increase variety, and extend seasonal availability, contributing to a healthier diet for U.S. consumers.

Increased agricultural imports, however, can raise the risk of inadvertently introducing foreign pests and diseases, and the resulting damage to domestic crops, livestock, and the environment can reduce or offset some of the benefits of trade. Trade is not the only vector for pests and diseases—natural factors, such as wind currents, can spread insects, fungal spores, pathogens, and weed seeds. Asian soybean rust, for example, may have entered the United States in conjunction with two hurricanes. Passenger baggage, migration of wild animals, and smuggling are also pathways for foreign pests and diseases. In 2002, an outbreak of exotic Newcastle disease in backyard poultry flocks in California may have been introduced through infected game birds smuggled from Mexico.

Nonetheless, it is widely recognized that trade, along with the packing materials and means of conveyance that make trade possible, can introduce foreign pests and diseases that can potentially jeopardize domestic plant and animal health. For example, the emerald ash borer and Asian long-horned beetle, which are damaging trees in the Northeast and Great Lakes States, are thought to have first entered the United States on wooden pallets in the 1990s. More recently, *Ralstonia solanacearum*, a bacterial pathogen that damages potatoes, eggplant, tomatoes, and other horticultural products was detected on greenhouse geraniums imported from Kenya and Guatemala but has been contained thus far.

Although not every introduction of a pest or disease results in its establishment, some grow and spread, leading to losses in present or future production or resource values and/or increased production costs. The cost of foreign pests and diseases can also include the temporary loss of export markets, such as when Japan, Korea, and other countries suspended imports of U.S. beef when bovine spongiform encephalopathy (BSE) was detected in an imported cow in December 2003. Comprehensive damages are difficult to ascertain, but studies by the National Plant Board, the Government Accountability Office, the Office of Technology Assessment, and others report that foreign pests and diseases cause billions of dollars of economic losses to U.S. agriculture each year, while also adversely affecting ecosystem values and services.

These cost estimates include sizable public expenditures, including emergency funding to address new pest or disease threats and outbreaks. Today, 21 Federal agencies are responsible for some aspect of managing foreign pests and diseases in the United States. USDA's Animal and

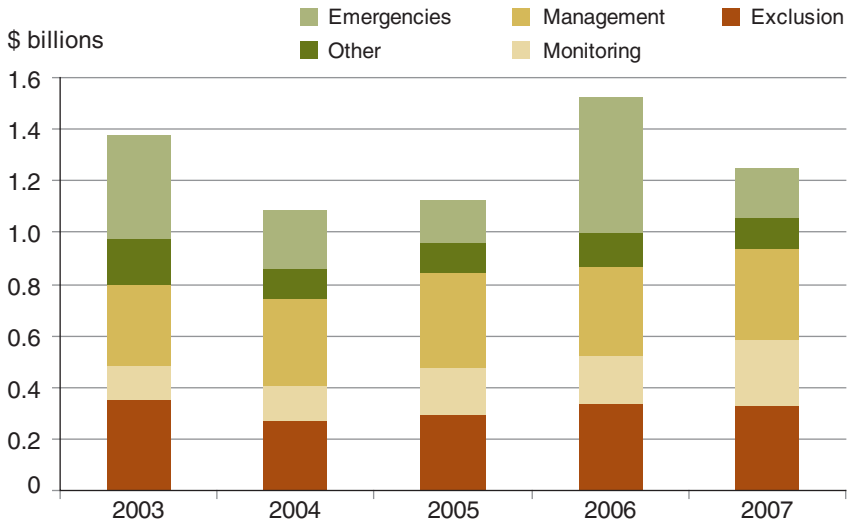
Plant Health Inspection Service (APHIS) has, by far, the leading role, accounting for about $9 out of every $10 that the Federal Government spends annually on prevention and control of foreign pests and diseases. Annual expenditures for APHIS programs ranged from $1.1 to $1.5 billion between 2003 and 2007, including emergency expenditures for programs such as increased BSE surveillance in 2004-06.

## Public Sector Has a Role in Reducing Risks From Foreign Pests

In some instances, farmers and ranchers can adopt available technologies or management practices to safeguard their crops or livestock and will do so if it improves their bottom line. Although the use of pest and disease controls will generally increase operating costs, they will also raise expected profits if yield or herd losses are sufficiently reduced. However, pest management decisions made by producers exporting to the United States may be made without accounting for the costs associated with unintentionally introducing foreign pests and diseases into this country. Economists describe these kinds of situations, in which the action of one economic agent affects the well-being or production possibilities of another, as *externalities*. For example, a farmer may apply a fungicide to reduce orchard yield losses to negligible levels, but if fruit harboring any fungal spores were exported to a country that grows more susceptible fruit cultivars, the fungus could cause widespread damages. When private production decisions result in negative externalities or spillovers, economic theory indicates that public intervention can increase societal well-being.

Furthermore, low prevalence of a pest or disease can be considered a *public good* if the pest is highly mobile, the disease is contagious, or either is initially widespread. Economists define a public good, such as regional control of a pest or disease, as a good or service that is *nonexcludable* (no one can be effectively excluded from using it) and nonrival (use by one individual does not reduce the amount available to another). Economic theory holds that markets will fail to provide incentives for individuals to provide these goods in the amounts that society considers optimal. In these instances, cooperative effort is needed to create the public good of improved production capacity, requiring public intervention in the form of monitoring, regulation, and/or control to reduce hazards to animal and plant health.

**APHIS outlays for pests and diseases exceeded $1 billion per year from 2003 to 2007**




**Source: USDA Annual Budget summaries.**

Tim McCabe, USDA/NRCS

## Economic Impacts Vary by Type of Intervention

Governments use a range of interventions to combat the entry of foreign pests. Best known, perhaps, are quarantine measures such as import bans. But other, more targeted, tools are also available. The level and distribution of benefits and costs along the international supply chain depend partly on the type of public intervention used. But even for a single type of measure, economic impacts vary widely depending on the specifics of an individual case.

A well-known example of quarantine measures is the U.S. ban on beef imports from countries where foot-and-mouth disease is endemic in cattle. The rules of the World Trade Organization allow the use of import bans and other sanitary and phytosanitary (SPS) measures to reduce the risk of international transmission of pests and diseases if such measures are based on scientific risk assessment, and their use is common. For example, countries accounting for 84 percent of global apple production are not currently eligible to export to the United States.

In evaluating such bans, economists try to measure the benefits of imports against the management, production, market, and/or resource costs that might be associated with an outbreak of a disease or pest. Studies show that this varies on a case-by-case basis. Import bans have reduced total welfare in some cases, because the cost of disease establishment was outweighed by the consumer benefits from imports. For example, APHIS estimated that the annual net benefits of replacing a longstanding ban on imports of Mexican avocados with more targeted phytosanitary measures totaled about $70 million, providing analytic support for USDA's decision to grant Mexico full access to the U.S. market in 2007. On the other hand, there can be cases where an import ban is less costly than the economic consequences of disease establishment, especially in those instances when the country might lose potential export markets.

Jean L. Williams-Woodward, University of Georgia

Even in instances where the benefits of an import ban outweigh the costs to domestic consumers, there still may be more efficient ways to mitigate foreign pest and disease risks if the costs of hazards and hazard reduction and the benefits of improvement are shared across borders. Economists have identified three potential approaches for the provision of global public goods when problems and solutions transcend national borders.

The *best shot approach* pushes or pulls private innovation by using public funds. An example of this approach is the decades of research and evaluation on the efficacy and safety of irradiation on fruits and vegetables by the World Health Organization, the United Nations Food and Agriculture Organization, the U.S. Food and Drug Administration, and other public institutions. This research laid the groundwork for commercial use of irradiation as a phytosanitary treatment to sterilize quarantine pests. This technology enabled USDA to lift bans on exports of mangos and other tropical fruits from Thailand, the Philippines, and India that have been irradiated to reduce the risk to negligible levels of infestation by 11 quarantine pests.

The *summation approach* is the creation of global mechanisms to enforce individual behavior along the supply chain and/or among countries so that the sum of individual actions produces the desired outcome. The international standard promulgated by the International Plant Protection Convention (IPPC) for wooden packaging material provides an example of this type of global public good. The standard sets out the terms for IPPC certification of heat treatment or methyl bromide treatment of wooden pallets, crates, and boxes to reduce the risk of transmission of timber pests such as the Asian long-horned beetle. Widespread acceptance of IPPC-certified packing materials provides a viable alternative to the required use of more expensive packaging materials in the international supply chain that would make trade more costly, and, in some cases, prohibitively expensive.

The *weakest link approach* uses foreign aid to overcome the constraint imposed by those with the fewest

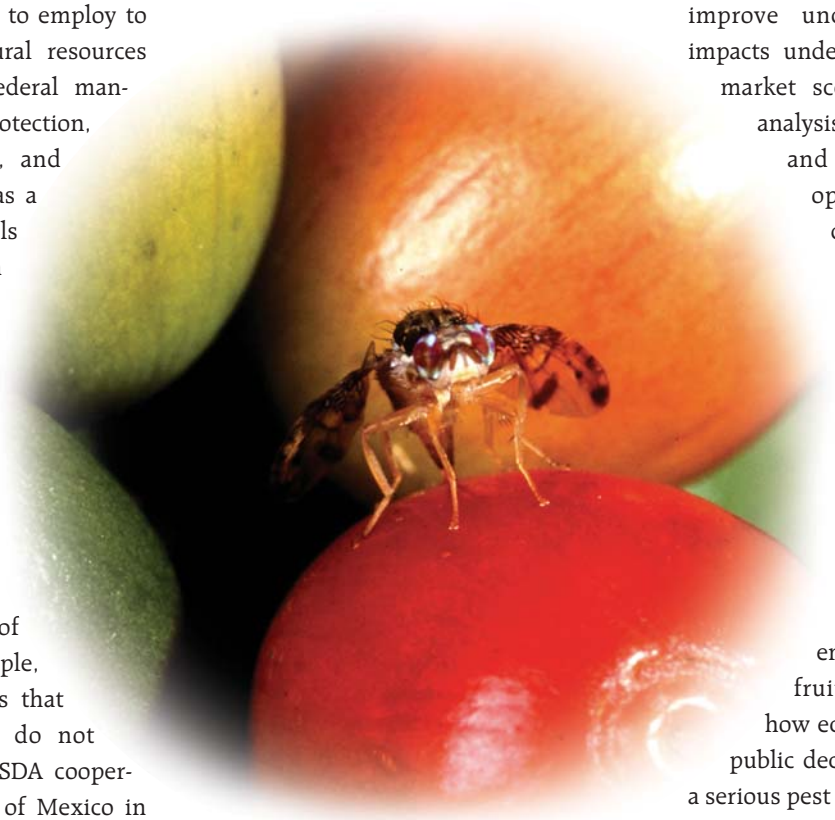
resources to combat a common problem. U.S. technical assistance for a capacity-building project that entailed training in pest risk assessment in West Africa provides an example of this approach. This project supported scientific assessments that facilitated USDA's approval of exports of eggplant, okra, and peppers from Ghana into the United States in 2007.

USDA determines which approach, or combination of approaches, to employ to protect domestic and natural resources under the authority of Federal mandates, including the Plant Protection, Animal Health Protection, and Federal Seed Acts. USDA has a wide range of regulatory tools at its disposal under each approach, including import protocols requiring agricultural producers and exporters abroad to adhere to specific pest and quality control guidelines and commodity inspection and quarantine programs at U.S. ports.

Usually a combination of measures is used. For example, to ensure that screwworms that afflict ruminant livestock do not enter the United States, USDA cooperates with the Government of Mexico in administering a fly sterilization and release program (weakest link approach). In addition, import protocols require the application of screwworm disinfection and monitoring protocols in Mexico (with additional safeguards required for the State of Chiapas) and at the U.S. port of first entry for imported live animals originating in Mexican States in which screwworm outbreaks have occurred (summation approach).

## Economic Analysis Can Inform the Choice and Design of Intervention Measures

Agricultural products are imported into the United States only after successfully completing USDA's approval process. After a country petitions USDA to allow importation of a specific commodity, APHIS conducts a risk assessment to identify the economic and environmental damage that pests associated with the commodity might cause if they were to enter the United States. No import is risk free, but APHIS may recommend that the commodity be allowed to enter if certain steps are followed to reduce pest and disease risk to levels acceptable to U.S. authorities.



Scott Bauer, USDA/ARS

Economic analysis of different options available to public authorities can improve the economic basis of pest and disease management decisions in three important ways. First, the most important determinants of the benefits and costs associated with different policies can be examined, highlighting the essential informational needs of public decisionmakers seeking to implement economically efficient measures. Second, the impacts of different policies on the pest management behavior of foreign and domestic agricultural producers can be analyzed to improve understanding of economic impacts under different infestation and market scenarios. Finally, economic analysis can quantify the benefits and costs of different policy options and determine the degree to which the costs of different options are borne by domestic and foreign firms and consumers.

## ERS Researchers Investigate Medfly Measures

A recent study by an ERS economist, which examined options for policies to reduce the risk of entry of the Mediterranean fruit fly (medfly), illustrates how economic analysis can inform public decisionmaking. The medfly is a serious pest for many fruit and vegetable crops and is known to exist in 65 foreign countries (hereafter referred to as quarantine countries). APHIS allows imports of fresh produce from these countries only if they have been treated to eliminate medfly larvae.

Currently, eight treatments are approved for the medfly. One of the most widely used is cold treatment, under which produce imported for fresh consumption must be refrigerated according to specific schedules (temperature-duration combinations) before allowed entry into U.S. markets.


Ken Hammond, USDA

Interceptions of live medfly larvae in separate shipments of clementines from Spain during November and December of 2001 prompted USDA to ban this fruit temporarily and re-examine its cold treatment protocols. After imports were suspended, APHIS launched an investigation to identify the causes of the infestations to determine if there were feasible phytosanitary measures that could be adopted to permit trade to resume. Investigators determined that the infestations were due to a number of factors, including unseasonably warm weather conditions and above-average medfly populations during the 2001-02 growing season, susceptibility of early-season clementine varieties, and problems with the application of cold treatment.

To mitigate these newly identified risks, APHIS proposed revised import regulations for Spanish clementines, including mandatory medfly population monitoring and threshold-based insecticide applications (see box, "SPS Measures for Spanish Clementines"). APHIS also proposed lengthening the mandatory cold treatment periods of all medfly host commodities, including clementines, imported from all quarantine countries. Economic and risk analyses concluded that allowing clementine imports from Spain under the new measures would increase expected net benefits relative to the ban that was put in place during the investigation. Following adoption of these measures in October 2002, USDA allowed clementine imports from Spain to resume.

Recently, ERS research extended this analysis to determine which cold treatment schedules would maximize net U.S. benefits from trade in 15 fruit and vegetables with all 65 quarantine countries. This analysis concluded that treatment periods with the largest net benefits closely correspond to the currently mandated treatment periods.

Another important finding was that the cold treatment period that maximizes profit received by a foreign producer varies with medfly population levels abroad. The results have important implications for policy design. When medfly populations are at or below normal levels, the results suggest that the economic incentives of fruit and vegetable producers in quarantine countries are consistent with U.S. cold treatment policy, because

## SPS Measures for Spanish Clementines

A complete description of the regulations (Title 7, Sec. 319.56-2jj) can be found at www.gpoacess.gov/CFR/retrieve.html. Briefly, Spanish clementine producers who export to the United States must register with the government of Spain and agree to adhere to the following management and inspection program:

Pheromone-baited medfly traps must be placed in orchards 6 weeks prior to harvest, and baited pesticide sprays using malathion, spinosad, or other approved pesticide must be applied according to a population threshold rule.

To improve compliance, registered growers are required to file detailed records of their medfly population data and pesticide sprays with the government of Spain and allow APHIS inspectors access to their groves and records.

Boxes of clementines must be clearly labeled to identify the orchard in which they were grown.

Before loading onto sea vessels for export to the United States, 200 clementines must be randomly selected from each individual shipment (not to exceed 200,000 boxes) by an APHIS inspector. If a single live medfly (egg, larvae, pupae) is found, the entire shipment is rejected, and if there is a second occurrence for the same orchard, shipments are suspended for the remainder of the season from that orchard.

Shipments that pass inspection must then undergo cold treatment prior to offloading in the United States.

APHIS inspectors examine the cold treatment data and inspect the fruit; if the cold treatment has not been successfully completed or if a single live medfly is found, the shipment is held until an investigation is completed and appropriate remedial actions implemented.

profits received by fruit and vegetable producers in quarantine countries are maximized at the treatment periods that maximize net U.S. benefits associated with trade in these commodities. However, when medfly populations abroad are above normal levels, the incentives of producers in quarantine countries could lead to cold treatment of produce imported into the United States at durations below what the U.S. has determined to be the optimal cold treatment period. This is because profits abroad are maximized at a lower treatment period. These results suggests that it is important to closely monitor fulfillment of cold treatment requirements and justify USDA's current practice of doing so, even though it increases private compliance costs and public enforcement expenditures. Containers accepted at U.S. ports are required to have temperature- and treatment-period duration gauges, which are examined at the port of first entry.

## Economists and Biologists Work Together To Inform Public Policy and Investment

Biology and economics play key roles in the arrival of foreign pests and diseases and in the processes by which they become established. Economic activities related to international trade, commodity and livestock production, and domestic commerce are pathways by which foreign pests and diseases penetrate the U.S. border and disperse to new areas. At the same time, to become established in new areas, pests require suitable habitats, compatible climatic conditions, and minimal populations of potential predators. To inform decisions about policy responses to today's challenges of managing foreign pests and diseases, research must address the joint impacts of economic and biological factors on the benefits and potential costs of agricultural trade. Such research is also critical to decisions about public and private roles for meeting new challenges that might arise from changing trade flows, cropping patterns, or pest populations. Finally, continuing research can help policymakers capitalize on new scientific discoveries and technological innovations in order to increase welfare-enhancing trade.

Peggy Greb, USDA/ARS

Hot water immersion is one type of quarantine treatment that can be used to reduce the risk of entry of pests and diseases on imported fruit.

**This article is drawn from . . .**

"Phytosanitary Regulations Shape Fruit and Vegetable Trade Patterns," by Megan Romberg and Donna Roberts, in *Amber Waves*, Vol. 6, Issue 2, April 2008, USDA, Economic Research Service, available at: www.ers.usda.gov/amberwaves/april08/datafeature

"Pest Problems Abroad May Affect Compliance With U.S. Safeguards," by Michael Livingston, in *Amber Waves*, Vol. 6, Issue 3, June 2008, USDA, Economic Research Service, available at www.ers.usda.gov/amberwaves/june08/findings/pestproblems.htm

"The Mediterranean Fruit Fly and the United States: Is the Probit 9 Level of Quarantine Security Efficient?" by M.J. Livingston, in the *Canadian Journal of Agricultural Economics* 55(2007a):517-528, available at: www.blackwellsynergy.com/doi/abs/ 10.1111/j.1744-7976.2007.00106.x)

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"What Share of U.S. Consumed Food Is Imported?" by Andy Jerardo, in *Amber Waves*, Vol. 6, Issue 1, February, 2008, USDA, Economic Research Service, available at: www.ers.usda.gov/amberwaves/february08/datafeature

ERS Briefing Room on Invasive Species Management, available at: www.ers.usda.gov/briefing/invasivespecies