Food Safety in Food Security and Food Trade

Case Study: Reducing Pesticide Residues on Horticultural Crops

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Production and export of horticultural products are increasing rapidly in many developing countries. From 1970 to 2002, fruit and vegetable production in developing countries almost quadrupled from 256 to 960 million metric tons, while exports more than tripled from 1.9 to 6.5 million metric tons. Demand for these high-value commodities is stimulated by income growth, reductions in transportation costs, and, in some cases, increased market access. Production for export is often encouraged as a means of generating foreign exchange, increasing incomes to producers, and providing employment for the rural poor. Importing countries benefit from increased supplies of products that historically have been scarce and expensive in the off-season.

Rapid growth in horticultural production has been accompanied by heavy use of pesticides and by heightened concern over health effects associated with pesticide use and abuse. Heavy pesticide use occurs, in part, because numerous pests attack horticultural crops, including the fruit itself, reducing market value and yield on high-value crops. Pesticide use raises safety concerns for agricultural workers who apply pesticides. Concern is particularly high in flower production because of heavy spraying in enclosed conditions. Potential food safety risks from pesticide residues are also a significant issue for importers of fresh fruits and vegetables and a market-risk factor for exporters who may have shipments detained or rejected if residues exceed allowable limits.

Countries must strike a delicate balance between minimizing pesticide residues and maintaining other aspects of product quality, while also trying to eliminate pests from horticultural shipments. Pests, particularly exotic or potentially invasive ones, can cause detentions at ports as quickly as pesticide residues can. Rejection of even one shipment because of the discovery of an unknown pest at a port can result in the exporting country being placed on a quarantine list for that commodity, thus eliminating one import market. Repeated violations of residue requirements can result in automatic detention (inspection or fumigation or both) of all shipments from a country until it can document sufficient preinspection quality control. Developing countries are especially vulnerable to detentions as many of their horticultural exports are nontraditional ones for which preinspection protocols may not exist. Therefore, these countries seek pest management approaches that minimize pesticide use and residues, while providing high-quality, pest-free produce under preinspection procedures that can be documented.

Integrated pest management (IPM) systems that rely on biological, cultural, and other less chemically intensive approaches to pest management are one answer. IPM systems have been developed for several horticultural commodities in developing countries to minimize residues and provide preinspection documentation. These systems require cooperation between the public and private sectors and between exporters and importers. The three examples below demonstrate how applied research to support IPM can reduce pesticide use, residues, and export barriers. These examples are drawn from collaborative efforts under the U.S. Agency for International Development (USAID)-funded Integrated Pest Management Collaborative Research Support Program (IPM CRSP).

SNOW PEAS IN GUATEMALA

Commercial production of nontraditional fruits and vegetables for export has been the fastest growing segment of the agricultural industry in Central America for the past 20 years. Since the early 1990s, horticultural exports from Guatemala have been plagued by detentions and rejections at U.S. ports because of the presence of pesticide residues or pests themselves. Snow peas (*Pisum sativum*), a primary Guatemalan vegetable export, have been under automatic detention by the U.S. Food and Drug Administration (FDA) since 1992, initially because of pesticide contamination and recently because postharvest handling programs did not meet FDA requirements for preinspection protocols. From 1995 to 1997 all Guatemalan snow pea imports were quarantined (rejected) by the U.S. Department of Agriculture when the presence of the leaf miner *Liriomyza huidobrensis* was discovered in a shipment. The result has been reduced competitiveness for Guatemalan snow pea exports since 1992, and losses of $35 million per year during a ban from 1995 to 1997.

The government of Guatemala, in collaboration with IPM CRSP, provided research and technical assistance that resolved the snow pea leaf-miner quarantine problem. Researchers discovered that the leaf miner found during the 1995 inspection was not a species exotic to the United States and consequently did not threaten U.S. producers. The Guatemalan government undertook IPM research and developed strategies to reduce pesticide use and residues on snow peas and to enhance product quality. The IPM program has an onfarm research and training component and a preinspection component for postharvest handling, so that most snow peas are produced and handled in a manner consistent with U.S. standards. Snow pea IPM systems in Guatemala have been included in government-supported integrated crop management demonstration and training programs that cover practices such as pest identification and monitoring, trap cropping, soil disinfection, biorational pesticide use, and variety selection.

About half the snow peas produced in Guatemala come from one of three systems: farms that both grow and ship, cooperatives that market for many producers, or growers who

produce under contract to export firms. All of these supply channels have good preinspection protocols. Independent producers supply the other 50 percent of snow peas in open market areas. Many of these producers have not adopted preinspection protocols, which is why Guatemalan snow peas are automatically inspected in U.S. ports, even though the U.S. has lifted the ban. The IPM CRSP, the Government of Guatemala, and private exporters are working together to improve practices among independent producers. For those growers who have received training in IPM and preinspection protocols since the program began in the mid 1990s, rejections at U.S. ports have been reduced by 50 to 75 percent.

HOT PEPPERS IN JAMAICA

The Caribbean region, including Jamaica, is exporting increased quantities of vegetables, including hot peppers. Because Jamaican peppers have arrived at U.S. ports infested with gall midge (the pest was found in more than 100 shipments in 1998), the U.S. Animal and Plant Health Inspection Service (APHIS) instituted mandatory fumigation. Pepper exports from Jamaica declined by more than two-thirds from 1997 to 2000 as a result of the added cost of this fumigation. In response, USAID's IPM CRSP program and several agencies of the Jamaican government developed a multifaceted IPM program. As a result, shipments found to be infested with gall midge have dropped by more than 90 percent. APHIS removed the mandatory fumigation requirement in 2002, provided growers met several conditions: they had to participate in the IPM field control program, and those with shipments rejected for the midge would be removed from the program.

In this case, IPM strategies involve (1) improving cultural practices and reducing pesticide use in the field, (2) substituting a less costly and an environmentally safe fumigant for methyl bromide when pre-clearance fumigation is needed, (3) instituting a system that enables each shipment to be traced back to the grower, (4) monitoring gall midge progression in the field, and (5) training extension officers and farmers. The hot pepper case illustrates the importance of multi-institutional farmer-to-consumer strategies for implementing a successful IPM program. More than 400 farmers have been assigned traceability numbers so far this year.

HORTICULTURAL CROPS IN MALI

The growth of commercial agriculture in many African countries, including nontraditional periurban horticultural crops, has resulted in increased pesticide use in that region. Horticultural crops, produced in Mali after the subsistence crop harvest, are exported to Europe during the winter months to provide supplementary income to producers. As markets develop abroad, and food safety standards continue to tighten domestically and internationally, environmental quality laboratories (EQLs) are needed to satisfy market requirements for safe foods. In Mali, the IPM CRSP joined with local agencies to develop IPM programs to manage disease and insect pests while reducing pesticide use on vegetables such as green beans. These IPM programs train farmers in field schools and provide technical support and equipment such as EQLs for residue analysis. Through these investments, Mali is developing a quality-assurance program that can meet the stringent requirements of horticultural import markets in Europe. Such efforts show that African nations, which have historically applied fewer pesticides than other countries, are increasingly forced to address pesticide residue issues and can do so successfully.

CONCLUSION

These three cases illustrate (1) the need to institute preinspection programs that include both farm-level IPM and postharvest quality-control mechanisms if a country hopes to reduce pesticide residues and remain competitive in international markets for horticultural products, (2) the need for public/private partnerships to facilitate adoption and documentation of appropriate pest control procedures, and (3) the benefits of cooperation between public agencies in exporting and importing countries in developing preinspection protocols. The Guatemalan snow pea and the Jamaican hot pepper cases illustrate the potential that IPM research, combined with stringent preinspection programs, has for improving market access. The Guatemalan case also demonstrates the difficulty of instituting widespread preinspection programs to meet stringent guidelines when thousands of small farmers are involved. But market requirements may eventually force a shift toward more structured marketing channels if horticultural exporters are to meet quality and safety guidelines. If farmers fail to meet these guidelines, they will be excluded from lucrative markets. Smaller producers, therefore, will likely be forced over time to increase in size, produce under contract, or join a marketing cooperative in order to survive as exporters. ■

For further reading see IPM CRSP, *Ninth Annual Report 2001-2002* (Blacksburg, Va., USA: Office of International Research, Education, and Development (OIRED), Virginia Polytechnic Institute and State University, 2003); and J. W. Julian, G. H. Sullivan, and G. E. Sanchez, "Future Market Development Issues Impacting Central America's Nontraditional Agricultural Export Sector: Guatemala Case Study," *American Journal of Agricultural Economics* 82 (November 2000): 1177–1183.

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