Many Rewards From International Cooperation

Agricultural researchers in the United States today are repeating Christopher Columbus' explorations, in reverse. Scientists with the Agricultural Research Service are traveling from the New World to the Old in search of solutions to key agricultural problems: how to combat a devastating crop pest, boost plants' resistance to a particular disease, or increase plants' tolerance to adverse settings.

That's because so many of the crops we now consider "as American as apple pie" are actually borrowed from other lands—soybeans from China, wheat from the Mediterranean and southwest Asia, rice from Asia.

In fact, there's been a steady stream of new crops to this country, carried by the unceasing human river that started with a handful of English settlers at Jamestown, Virginia, in 1607. And just as many of our crops hailed originally from other shores, so did many of our crop pests. For example, Hessian flies that supposedly came to this country with mercenary troops fighting in the American Revolution ultimately waged war on the U.S. wheat crop. Descendants of boll weevils that migrated northward from Central America in the 1890s today cost the U.S. cotton industry $300 million annually.

This agency—and American agriculture—have already benefited in many ways from international cooperation, with the promise of many more rewards to come. A few examples:

- ARS scientists at Baton Rouge, Louisiana, are collaborating with Russian scientists on studies of bees from Russia's Primorsky region that appear more resistant than U.S. bees to the devastating varroa mite. Within U.S. honey bee colonies, this mite has taken a drastic toll since it arrived from Mexico in the mid-1980s.

American beekeepers must typically treat their colonies twice to fight back the mites, whereas Russian beekeepers treat only once annually and find far fewer varroa mites in their colonies. If the Russian bees have some extraordinary built-in resistance to the mites, they might eventually be made available to U.S. beekeepers for breeding or crossbreeding, as a natural alternative to current chemical treatments of fluvalinate to combat the mites.

- An ARS researcher teamed with scientists in Brazil, Poland, and Mexico to find a gene in rye that could help wheat, a major food staple, grow on millions of acres worldwide that are now inhospitable to the crop. The gene enables wheat to resist toxins in aluminum often found in acid soils—the type of soil that covers 5 billion acres in this country and overseas. If wheat can be adapted to tolerate aluminum-heavy soils, the vital result could be significantly more food for a mushrooming world population.
- ARS and French scientists have collaborated on development of reliable technology to transfer new genes into insects. Agricultural benefits could include reducing the need for chemical insecticides by increasing effectiveness of beneficial insects that attack weed and insect pests. But the possible benefits reach far beyond the farm: Genes might be transferred into mosquitoes, for example, that would prevent them from transmitting the parasite that causes malaria, the killer of about 2.7 million people worldwide every year.
- Collaboration between ARS researchers and a professor of biological sciences in Kazakhstan has resulted in American explorations in the mountains of Kazakhstan and Kyrgyzstan to collect wild apple germplasm that might harbor genes to help U.S. apples naturally resist pests and diseases. It's believed that the domestic apple, *Malus x domestica*, was born and evolved in Central Asia's rugged mountain terrain. A trip in 1993 resulted in gathering of 129 apple samples, called accessions, including many in the wild species *Malus sieversii*, a major genetic contributor to the apples grown in the United States. Some of the seedlings grown from seeds gathered on the 1993 trip have shown natural resistance to apple scab, a fungal disease that's one of the most serious problems for apple growers.

International cooperation takes many forms: swapped cotton germplasm in Uzbekistan; a winter nursery for cotton and kenaf at Tecoman in Mexico for use by American federal, private, and university plant breeders, courtesy of a joint agreement between the Mexican government and the United States' National Cotton Council; field tests of hairy vetch as a natural mulch for vegetable crops in Poland; and, as you'll read in this issue of *Agricultural Research* magazine, collaborative efforts with South Africa to develop new blooms for the American floral industry—and new markets for small South African farmers.

By giving researchers the freedom to go back to crops' historical roots to find natural resistance to or natural enemies of important crop pests, we dramatically increase the odds that the projected 9-billion world population in the year 2046 will have sufficient food, drinkable water, and clean air. No matter which seat you occupy at the world's table, that's a worthwhile goal.

A. Rick Bennett
Actg. Assist. Admin., ARS Office of International Research Programs