American Wheat Farmers Benefit from U.S. Agricultural Investments Abroad

Research supported by U.S. foreign agricultural assistance has produced new wheat technologies now widely adopted by American farmers. Wheat is the third most important field crop in the United States in planted acreage, production, and gross farm receipts and is produced at large scale in 29 states, with the largest production occurring in Kansas, North Dakota, Montana, Washington, and Oklahoma.

A Green Revolution in wheat productivity occurred globally, and most pronouncedly in South Asia, in the 1960s and 1970s. Much of the improvement in productivity came from the development of new high-yielding wheat varieties bred from semi-dwarf wheat from Japan. American wheat researcher Norman Borlaug and other scientists at the International Maize and Wheat Improvement Center (CIMMYT) in Mexico developed the new varieties and released them in many countries, including the United States. CIMMYT is one of the founding research centers of CGIAR, a partnership of 15 agricultural research centers, which USAID began supporting financially in the 1960s. Compared to conventional varieties of the time, the new varieties were more responsive to fertilizer and shorter in stature, which reduced losses from lodging (falling over) of the stalk as the grain head matured. Though the research had originally targeted wheat production in developing countries, semi-dwarf breeding lines developed by CIMMYT were also used by plant breeders developing wheat varieties for the United States. By the early 1990s, about a fifth of total U.S. wheat acreage was sown to varieties with CIMMYT ancestry. Today, semi-dwarf wheat accounts for 99 percent of wheat acreage globally. While not all these varieties have CIMMYT parentage, CIMMYT and U.S. support for its research played a catalytic role in the development of this new wheat technology now widely used by American farmers.

Today, USAID-supported wheat research programs at Kansas State University and Washington State University are using cutting-edge scientific methods to reduce the length of the wheat breeding cycle. USAID's financial support has enabled the programs to build infrastructure and systems to refine research tools and disseminate them to wheat breeders in both developing countries and the United States. An important goal of both programs is to develop heat-tolerant wheat varieties. Heat stress is a major limiting factor for wheat varieties commonly planted worldwide, including in the United States. The researchers, by investigating heat stress in even hotter climates such as those of India, gain greater understanding of the genetic factors that affect heat tolerance. This knowledge, together with the use of genomic, molecular, and physiological methods, speeds up the development of heat-resistant wheat varieties and ultimately will benefit American farmers in the form of new breeding lines and new released varieties that maintain or improve productivity.

In addition, the USAID-funded Kansas State wheat lab has analyzed over 45,000 lines of wheat from around the world to increase plant breeders' accuracy in predicting traits at different stages of the breeding cycle. Improved prediction of wheat traits reduces the time and cost of producing new varieties.

Research on wheat stem rust protects U.S. and developing country crops

Historically, wheat stem rust has been the most damaging disease for wheat. Within weeks, a healthy-looking crop near harvest can be largely destroyed, reducing yields by 70 percent. An estimated 90 percent of the world's wheat production is vulnerable to wheat stem rust. Nine outbreaks of wheat stem rust occurred in the United States during the 20th century. In 1935, 1953, and 1954, wheat stem rust destroyed up to 50 percent of the wheat crops in Minnesota and North Dakota and at least 20 percent of the wheat crops in South Dakota. Researchers identified a wheat gene, Sr31, that suppressed wheat stem rust, and new wheat varieties based on this research kept the disease under control for three decades. However, in 1999, a virulent strain of wheat stem rust known as Ug99, which cannot be suppressed by the Sr31 gene, was discovered in Uganda. Since then, Ug99 has spread to 12 countries in Africa and Asia. Wheat industry experts believe the disease could spread to North America and pose a serious threat to the wheat industry.

Research is an important part of the U.S. government's action plan to minimize the risk of Ug99, and USAID is one of the agencies funding the research. The plan involves monitoring, germplasm enhancement, gene discovery, development of molecular markers for rust resistance, and wheat variety development. Some of the research is conducted at the Cereal Disease Lab operated by the USDA Agricultural Research Service at the University of Minnesota. Scientists there are breeding new rust-resistant wheat varieties suitable for agronomic conditions in the United States. A cooperative agreement between USAID and USDA provided funding for a state-of-the-art greenhouse at the lab. Researchers at the lab, funded in part by USAID, have identified wheat genes resistant to wheat stem rust. This is an important step toward the development of wheat varieties that can save the wheat harvest in the United States and other countries from the ravaging damage of wheat stem rust.

U.S. foreign agricultural assistance investments bring substantial economic, health, and security benefits to the United States. This brief highlights a report commissioned by the Board for International Food and Agricultural Development (BIFAD) on how the United States benefits from agricultural and food security investments in developing countries. The full report is available for download at: https://doi.org/10.2499/p15738coll2.133419

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