APAC Agricultural Policy Analysis Center
The University of Tennessee

PolicyPennings by Dr. Daryll E. Ray

# Availability vs. farmers' accessibility to genetic research on food crops

The United States Department of Agriculture's Agricultural Research Service (ARS) just released the May/June issue of their magazine, Agricultural Research. The focus of this issue was announced on the cover, "Fighting World Hunger with Genetics," and includes articles on rice, beans, wheat, corn, and potatoes.

Rice "is the main staple for more than half the world's population," the first article noted, and is subject to a number of diseases that ARS researchers are tackling. The article specifically identified two of the diseases ARS researchers are investigating-sheath blight, a fungal disease that kills plant cells reducing grain yield and quality; and rice blast, another fungal disease.

In both cases, the researchers are looking beyond the application of fungicides to identify genetic materials that confer resistance to these diseases. In conducting this research they look at a wide selection of varieties worldwide to find those that show resistance to the diseases and then work to identify the genetic material responsible for the resistance with the goal of breeding that genetic material into common rice varieties.

In each case, the researchers use sophisticated genetic testing procedures to enhance what are essentially traditional breeding programs. The identification of specific chromosomes makes the breeding programs faster and more efficient.

Anna McClung, research leader for ARS research laboratories in Stuttgart, Arkansas and Beaumont, Texas, said, "The exchange of plant germplasm and genetic stocks helps to identify genes and genetic markers that can be used by rice breeders globally to develop new cultivars that will sustain agriculture and help feed the world."

The magazine also identified Golden Rice-2, a transgenic rice that has been bred to provide beta-carotene, a nutrient not traditionally found in rice. Beta-carotene can be converted by the body into Vitamin A, reducing the incidence of a number of diseases caused by vitamin A deficiency. Researchers have determined that a cup of Golden Rice-2 contains about half of the Recommended Dietary Allowance for Vitamin A for adults.

The story about beans is similar to that of rice but was focused on a different constellation of diseases. Again, the search is to identify genetic markers of chromosomes that convey disease resistance to rust, blight, and mosaic virus, as well as tolerance to heat and drought. Bean researchers are also examining ways of improving the bioavailability of micronutrients in beans like iron.

With wheat, barley, and other small grains the focus is on rust, a disease that reduces yield in these crops. The researchers are looking at varieties from around the world to identify chromosomes that have the ability to confer rust-resistance to their progeny. With corn the task is twofold. The first problem is to improve the beta-carotene levels in corn varieties. It turns out that the color of corn does not necessarily indicate the level of beta-carotene in different corn varieties, so researchers are looking for ways to better determine the level of beta-carotene in different varieties and the relevant genetic markers.

The story about potatoes includes the familiar concern for the potato blight that caused the Irish Potato Famine of 1845. ARS researchers are looking at ways to increase the storability of potatoes so that potatoes used months after harvest contain the same nutrients and cooking properties that were there at harvest time. Additionally, they are looking at ways to increase the Vitamin C, protein, and antioxidant levels of potatoes.

All of the stories were interesting, but what was lacking was any extended discussion of how this research was going to combat hunger around the world. In a real sense the technology transfer issue that is so critical to the issue of the reduction of hunger was glossed over. As we read the articles, we were looking for hints of whether or not this research would result in public varieties where farmers around the world could save seeds for the next harvest. Or was the overriding assumption that the research would increase US production and exports?

There were hints that the genetic research could be used to improve local varieties around the world, but if we are going to be "Fighting World Hunger with Genetics," the roadmap of how this technology is going to reach the small holder in Africa that grows a variety that is limited to a small area needs to be clearer.

We raise these concerns because in the US the control of genetic resources has become very limited, with a few companies holding most of the pat-

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ents. While technology fees can come out of increased revenues for US farmers, for most small holders around the world the presence of tech fees and the purchase of seed each year could put the benefits of genetic research beyond their grasp.

The potential of genetic research will best benefit the hungry of the world if it is done by publicly and donor funded institutions that are committed to making public varieties available to farmers at a nominal cost and that allow farmers to save seeds after the first year. Farmers also need genetic research to be expanded to local varieties of common crops and indigenous crops that have heretofore been ignored.

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