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WORLD'S MOST DROUGHT-TOLERANT BARLEY DEVELOPED IN SYRIA

New Plant Types Could Prevent Crop Failures that Result in Hunger and Malnutrition

ALEPPO, SYRIA and JOHANNESBURG, SOUTH AFRICA, 26 August 2002. In the face of severe drought, water scarcity, and food shortages across much of Asia, Africa, and Central America over the last few years, scientists announced today that they have developed the world's most drought-tolerant barley plants. The new plant types are half as susceptible to drought as ordinary barley.

A farmer-scientist research team at the International Center for Agricultural Research in the Dry Areas (ICARDA), based in Aleppo, Syria, which is one of the 16 Future Harvest Centers, discovered the new lines of barley in northwest Syria under extreme drought conditions in 2000. The new barley plants produced more than half a ton of grain, while the regular varieties failed to produce any grain. This was one of the driest years on record in the Middle East since 1960 and a period that saw massive crop failures throughout Central and West Asia and North Africa (CWANA). Barley harvests in Syria alone dropped 65 percent during this timeframe.

"ICARDA has been working on developing new drought-tolerant barley varieties since the late 1980s," says Prof. Dr Adel El-Beltagy, a leading expert on dry land agriculture and Director General of ICARDA. "Now, in just two planting seasons, we can conclude that this variety is the world's most drought tolerant, as we have seen the variety pushed to the limits of survival during the last few years, and instead of suffering, it has thrived."

Barley is the fourth most important cereal crop in the world after wheat, maize and rice. It is widely grown throughout CWANA, and the high Andes. Farmers grow about 70 million hectares of barley, and global production amounts to 160 million tons.

The new lines of barley, El-Beltagy adds, will be designated for priority testing in Afghanistan—where barley is common—later this year as part of recovery efforts for the nation. According to the Food and Agriculture Organization of the United Nations (FAO), in 1990 Afghan farmers produced more than 200,000 tons of barley. While no reliable figures exist for current production, most experts believe that it has dramatically declined due to drought.

Pushing the Limits of Crop Survival

Barley grain is used for food consumption, malt, and as feed for animals. In many countries, people eat barley in soups, breads and cereals. It provides a

good source of energy since carbohydrates constitute 80 percent of the barley kernel. Barley has been considered a high-energy food since the Roman times, when the gladiators were fed a barley diet before going to the Circus.

"Barley is a particularly important crop for resource-poor farmers," says Dr Salvatore Ceccarelli, ICARDA plant breeder. "It performs well in marginal environments under extreme temperatures and with little water."

According to Ceccarelli, farmers' fields received just 120 millimeters (4.7 inches) of rain in 1999 and 107 (4.2 inches) in 2000. Ordinary barley requires at least 200 millimeters (8 inches) to produce an adequate yield. In a normal year, farmers can produce more than a ton (1000 kilograms) of barley per hectare, but harvests of 500 kilograms are more the norm. Under hostile environmental conditions, however, ordinary varieties typically suffer, often cutting yields by more than 50%.

"A 500 kilogram harvest, may not seem like a lot to barley farmers in the industrialized world," Ceccarelli cautions. "But to poor farmers in CWANA, harvesting 500 kilos means not being forced to sell off the family's livestock or leave one's family to seek work in the cities."

The new variety was developed through traditional crossbreeding in which a line selected from a landrace (farmer's variety) was crossed with wild barley from Palestine. Ceccarelli, who is responsible for ICARDA's barley breeding program, also heads up the Center's Farmer Participatory Research Program, which tries to tap farmers' traditional knowledge and expertise, and provide new technology in return.

"When you breed crops like barley on an experimental station, you're breeding in an artificial environment," Ceccarelli says. "Participatory plant breeding increases the probability of giving farmers what they really want."

What they want, Ceccarelli hopes, can be found in the thousands of experimental barley lines that he and his colleagues developed at ICARDA over the past 15 years and that farmers have voluntarily planted through the participatory research program.

Farmers—The First Scientists

A great deal of the credit for the discovery of ICARDA's most drought-tolerant barley lines, Ceccarelli says, goes to three farmers--Mohammed Issa, Ahmed Haj Saleh and Georges Kalunji--who first observed the new lines growing in their fields in the villages of Jum Al Assad, Byalonan, and Tel Brack.

"Long before scientists got involved in agriculture, farmers like Mohammed, Ahmed and Georges selected barley plants from the wild species that grow naturally in their fields," Ceccarelli adds. "Scientists are late-comers to the process," he says.

"Farmer participatory research gives traditional barley farmers the opportunity to evaluate the best crosses that modern science can provide and have them select the best materials under their own conditions. It is not much different from what farmers have been doing for centuries, just a lot faster," he says.

The barley varieties that farmers grow today were derived from wild plants through a process in which farmers selected the most promising plants for their conditions. In a traditional plant breeding program, Ceccarelli says, scientists look for a few outstanding lines that can be grown across vast areas. The process involves discarding large amounts of genetic material that do not appear to be useful under the conditions found on an experimental station. ICARDA's participatory plant breeding program tries to help farmers select for their specific conditions rather than for conditions found at experiment stations. There are cur-

rently 300 farmers involved in the Center's Participatory Barley Research Program working in Egypt, Eritrea, Jordan, Morocco, Syria, and Tunisia.

"Farmers need different types of barley to survive in the harsh and highly variable environments where barley is typically grown. In a participatory plant breeding program, no barley line is removed from the process until the farmers say so," Ceccarelli notes. "If farmers are not interested in a line, it is returned to our genebanks for safekeeping." ICARDA maintains 50,000 types of barley that it safeguards under an international agreement with the Food and Agriculture Organization of the United Nations (FAO). Barley farmers in this region have been growing the same landraces for centuries, Ceccarelli adds. "I doubt they knew there were other types of barley that they could work with. Through participatory plant breeding, they are beginning to see what science can offer and that there are alternatives to subsistence farming."

Indicative of that, Ceccarelli says, is the fact that farmers are now asking him to combine different characteristics from the breeding lines that they test in their fields, which is something very new. Another sign of their interest is the fact that the farmers are now permitting ICARDA scientists to interview their wives and daughters, a big shift in the tradition and one that greatly improves the program effectiveness.

"Without this new approach," he adds, "I doubt that we would have identified the new drought-tolerant lines. Farmer participatory research is a totally different way of operating. It is not the way I was trained, and it is not the way I worked early in my career. But I will never go back."

ICARDA's Farmer Participatory Research Program received initial financing from the German Ministry for Technical Cooperation (BMZ), the German Agency for Technical Cooperation (GTZ), the International Development Research Centre (IDRC of Canada), the Danish Agency for Development Assistance (DANIDA), Government of Italy, the Organization of Petroleum Exporting Countries (OPEC), and the World Bank. Because of the high priority accorded to it by ICARDA, it currently operates with unrestricted financing provided through the donors of the Consultative Group on International Agricultural Research (CGIAR) based in Washington, DC.

ICARDA's (www.icarda.org) mission is to improve the welfare of people and alleviate poverty through research and training in dry areas of the developing world by increasing production, productivity, and nutritional quality of food, while preserving and enhancing the natural resource base. ICARDA is a Future Harvest Center.

Future Harvest (www.futureharvest.org) is a global nonprofit organization that builds awareness and support for food and environmental research for a world with less poverty, a healthier human family, well-nourished children, and a better environment. Future Harvest is an initiative of 16 food and environmental research centers that receive funding from the Consultative Group on International Agricultural Research (CGIAR).