Scientists and Farmers Join Forces to Conserve Mexico's Maize Diversity

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[Photo: The Mexican state of Oaxaca is home to more than 150 varieties of maize.]

In supermarkets, it often seems there is just one type of corn for sale — two if the store carries blue corn chips. But in just one region of the Mexican state of Oaxaca alone, there are more than 152 local varieties or land races of corn. The grain was domesticated some 6,000 years ago in Meso America, an area that includes Mexico, Guatemala, northern Honduras, and El Salvador. Corn or 'maize' is still the region's most important staple, for which Mexicans have created more than 600 recipes.

The diversity that feeds and flavours life in Oaxaca, however, may not last forever, says Mauricio Bellon, a scientist with the Economics Program at the International Maize and Wheat Improvement Center (CIMMYT), near Mexico City. Economic development could wipe out land races as farmers switch to commercial agriculture or abandon agriculture altogether, he stresses. An even worse scenario would be diversity loss without development, because CIMMYT researchers have found that the broad diversity of maize helps local farmers cope with poverty.

Planting strategies

Using seeds they save, usually from their last harvest, maize-growing households in Oaxaca often plant more than one land race in order to take advantage of different traits such as drought resistance, higher yields, or a sturdy stalk. Different varieties also fulfill different needs: some are good for animal feed while others make tastier tortillas.

But when they lose a crop, today's farmers (who are generally also waged labourers) may no longer have a strong local network of family and friends to replace their seeds — as was traditionally the case — nor do they always have the time to find out who else is using the variety they lost. If the number of land races in use declines, farmers will lose their ability to weather the Mexican economy's ups and downs, and the world will lose the varieties's genetic traits, which may include resistance to diseases or certain climatic conditions.

Working together

In 1997, CIMMYT and the Instituto Nacional de Investigaciones Forestales Agrícolas y Pecuarias (INIFAP) from Mexico set out to explore where scientists and farmers can join forces to conserve maize diversity, with funding from the International Development Research Centre (IDRC). Some experts say that a few bags of seed in the freezer of a 'gene bank' is enough to preserve the genes any given race may contain, but Dr Bellon disagrees. Although the maize conservation project includes sampling to add to CIMMYT's collection of Oaxaca land races, he and other researchers are convinced that the seed taken from a plant in evolution is an important complement to its frozen cousin.

"You can have the genes, the pieces, but the interactions present in that live plant, which is evolving, are lost in the freezer. And that is what the farmers maintain, those transformation processes ... a great diversity of materials that are being exposed to all of the evolutionary pressures, year after year," says Dr Bellon.

Role of farmers

The underlying hypothesis of CIMMYT's work in Oaxaca is that farmers play a role in breeding when they select, at harvest time and throughout the year, the cobs whose seeds will be planted next season. The Center aims to understand that role, document its effect on the diversity of genes, and find ways of helping farmers improve what they already do, explains Dr Julien Berthaud, who heads the project's genetic research component.

So far, the project has been a learning experience for everyone involved. For example, Dr Bellon recounts the story of how a corn variety with purple plant parts was put on the list of the 17 regional land races (six of which were scientifically improved) that the project would monitor. Agronomists had not been impressed with this variety, which was provided by a sole farmer who had inherited it from his sister. But 54 % of the women polled had favoured it. Why? It turns out that it was easier to separate the kernels from the cob of this variety and that women liked the purple hue its husks gave to tamales.

Consumer mentality

In the six Oaxaca communities that CIMMYT is working with, most of the farmers grow maize for household use, so they have a consumer rather than a commercial mentality. They invest little money and sometimes little time in farming. Among the characteristics they look for in maize varieties are drought tolerance, because they rely on rainwater; resistance to insects in storage; disaster avoidance; grain weight; and flavour in tortillas.

What scientific breeding has provided these farmers is limited, the research team has discovered. Only one of the six Oaxaca communities surveyed by CIMMYT uses scientifically improved seeds — and on just seven percent of its land. (In contrast, Mexico's north-central agricultural zone of El Bajío and northern states farm extensively with improved seeds.) These are viewed as "seeds for the rich," noted one Chiapas farmer, who explained that he needs a less demanding variety that can survive neglect if he is busy with his waged work and cannot attend to his fields regularly.

Training

The researchers believe they can help the Oaxaca farmer to achieve better performances with existing seeds through training, which can give farmers more efficient ways to preserve the characteristics they value in seed. For example, the team explained to local farmers that it is better

to select seeds in the field rather than at home, by identifying the plants that performed best in the conditions they faced. The team also taught farmers to cut the spikes off unwanted plants to prevent the dissemination of undesirable genes, and to build seed pools from as many cobs as possible to maximize gene diversity. CIMMYT will test the effectiveness of these measures over the next few years.

Perhaps the most valuable outcome of this project will be the understanding that researchers gain of farmers' seed management, complete with a genetic picture of what occurs in their fields. This information can then be used to model what happens when improved grains are introduced. (The farmers' practice of mixing seeds with those from friends and family, for example, could work against the introduction of CIMMYT's 'Quality Protein Maize' in Oaxaca, which loses its properties when mixed with others.) The model could also help predict the impact of genetically modified seeds in a non-commercial farming system.

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