Food Security — Seeds of Threat, Seeds of Solutions

Modern agriculture faces a significant threat: genetic erosion. Ironically, plant breeders' very success in developing new high-yielding cereal varieties over the last decades could lead to a gradual loss of plant species, threatening the world's future food security. Even more ironic, this threat can be overcome only with the help of small farmers in remote areas of the world who have benefited little — if at all — from the advances in plant breeding.

The Food and Agricultural Organization (FAO) of the United Nations estimates that only three percent of all plant varieties available to agriculture today are in use. Just 12 species provide three-quarters of the world's plant-based food. And dependence on that narrow genetic base makes the world's food supply vulnerable to disease or sudden climatic change.

Five years ago, in a report on the state of the world's plant genetic resources and the world's future food security, the FAO warned: "It may be necessary to rethink conventional plant breeding strategies." This is where the small farmers come into the picture.

Millions of small farmers on marginal lands in Africa, the Middle East, Asia, and Latin America get little or no benefit from the high-yielding varieties because the seeds are expensive, they require costly fertilizers, pesticides, and irrigation, and they need ideal growing conditions. So these farmers continue to experiment with a large variety of local seeds that work best for them, and constantly select and share the seeds that will produce even under adverse conditions.

In doing so, they are maintaining and expanding the genetic variation — the biodiversity — that is essential to the continued evolution and adaptation of plant genotypes, according to pioneering researchers like Salvatore Ceccarelli. He is a plant breeder who has worked for many years in Syria with the International Center for Agricultural Research in the Dry Areas (ICARDA).

Ceccarelli believes it is important to give the farmers "the freedom to do what they believe is important to do, and to do research in a way that makes sense to them." By doing just that, and having trained researchers work alongside the farmers in the fields — instead of staying in their laboratories — many promising new varieties have been developed, and the approach is being duplicated throughout the region in countries such as Egypt, Jordan, Turkey, and Yemen.
Even before the FAO issued its warning, a few researchers like Ceccarelli had begun to do things differently. Realizing that conventional plant breeding poorly served small farmers, these innovators stressed the value of maintaining biodiversity. And they recognized the key role of farmers as participants in research rather than merely as recipients of it. They called this new approach "participatory plant breeding."

With the support of international agencies, including Canada's International Development Research Centre (IDRC), participatory plant breeding is proving to be successful in many parts of the world, increasing biodiversity and improving people's livelihoods. Equally importantly, it is starting to get the attention of government decision-makers.

"The involvement of policymakers and institutions is crucial if this approach is to become part of the mainstream," says Yiching Song, a researcher with the Center for Chinese Agricultural Policy (CCAP). And she believes it must become part of the mainstream. Maize is the third most important food crop in China, yet most of the country's maize production comes from a few hybrid crosses that share the same inbred line — a classic example of genetic erosion.

While agricultural biodiversity is vitally important to continued food security, it is significant for other reasons as well. Diversity speaks in favour of quality and choice. Food quality is an issue that is essential to good nutrition, and is increasingly attracting the attention of governments and consumers alike. In the Netherlands, for example, the Ministry of Agriculture, Nature Conservation, and Fisheries has been renamed the Ministry of Agriculture, Nature, and Food Quality. Choice is equally important to consumers — witness the phenomenal growth in popularity of "organic" foods and the spreading concern over the use of genetically-modified organisms (GMOs) in foods.

Maintaining and strengthening biodiversity requires actions globally and locally. Economic incentives, market access, and fairer prices are needed to make small farm enterprises more resilient. Seed "ownership" questions must be resolved. Participatory plant breeding cannot become a sort of "reverse brain drain" whereby the North simply extracts what it needs from the South. Farmers must be recognized for their skills and be fairly rewarded. They need stronger, continued, and demand-driven support from the formal research sector, just as innovative researchers need the space to continue their experiments in collaboration.

Above all, scientists and policymakers at all levels need to respect farmers as plant breeders in their own right. In Cuba, a young researcher named Humberto Rios willingly admits that his team is learning much from working directly with farmers. But he says the major lesson is in how the farmers have responded. "They are expressing new ideas and starting to make decisions about the management of biodiversity. As a result there has been a considerable increase in the genetic diversity."

The threat of genetic erosion is real. By continuing to support participatory plant breeding projects around the world, donor countries such as Canada are not only helping to reverse the process, they are improving the lives of millions of farmers who may hold the key to global food security.

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