A six-year project is setting out to help resource-poor farmers make the most of local crop diversity to control pests and diseases. The first step will be to talk to farmers to find out more about how they currently use crop diversity to protect their harvests from pests and diseases.

Diversity to manage pests and diseases

Every year, around 30% of the world's harvest is lost to pests and diseases and the people worst affected are resource-poor farmers in the developing world. A number of measures could be taken to help limit losses. Pesticides and fungicides are one solution, but they can damage the environment and harm people's health and are often too costly for poor farmers to afford. Modern varieties bred to resist pests and diseases offer another possible solution, but planting large areas with genetically uniform resistant varieties could provide ideal conditions for new strains of pests and diseases to evolve. Hence the resistance of the variety may fail after only a few cropping seasons. Smallholder farmers are in any case often unable to get hold of the latest modern varieties, and most of the time they are too poor to buy them. Furthermore, modern varieties often do not perform well in marginal areas with low inputs.

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Researchers for the project are trained in the use of participatory diagnostic protocols. Here they are pretending to be farmers and have labelled their different varieties based on the traits farmers would use to distinguish between varieties.

"Farmers in the developing world need sustainable solutions that are low input, affordable and environmentally-friendly," explained Devra Jarvis, Senior Scientist at Bioversity and one of the lead scientists of the project, which is funded by UNEP-GEF (United Nations Environment Programme–Global Environment Facility) and the Swiss Agency for Development and Cooperation. These more sustainable, cost-effective solutions, she believes, could lie in the diversity of traditional crops and varieties, a resource that smallholder farmers can easily access and make use of.

In November 2007, the first phase of the project—Conservation and Use of Crop Genetic Diversity to Control Pests and Disease in Support of Sustainable Agriculture—was formally launched at a global meeting of partners in China. The project will work with small-scale farmers in four countries—China, Ecuador, Morocco and Uganda—and aims to help them to make use of the local diversity of key staple crops to minimize the damage caused by pests and diseases.

The project focuses on banana (*Musa* spp.), barley (*Hordeum vulgare*), common bean (*Phaseolus vulgaris*), faba bean (*Vicia faba*), maize (*Zea mays*)

and rice (*Oryza sativa*). Bioversity will collaborate with a range of national and international partners, including CIP-UPWARD (International Potato Center–Users' Perspectives with Agricultural Research and Development), FAO (Food and Agriculture Organization of the United Nations), IFPRI (International Food Policy Research Institute), IRRI (International Rice Research Institute), local non-governmental organizations and universities.

Considerable evidence exists to support the project's approach to pest and disease management. Studies of advanced agricultural systems have shown that crop mixtures and rotations can reduce the damage caused by pests and diseases. Research has also revealed that many farmers already use the diversity of traditional varieties and mixtures of modern and traditional varieties in this way. The benefits of such an approach are clear: not only is it affordable and environmentally sustainable, it also protects the diversity of the local agricultural ecosystem.

"We are working to identify systems where farmers can reduce the vulnerability of their systems and limit their losses by planting a diversity of varieties in their fields," noted Jarvis. This diversity acts as a buffer, improving stability of a system even under stress.

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A farmer in Uganda tells a Bioversity researcher about the varieties of common bean she grows and their diseases.

A farmer in Morocco tells project partners from China, Ecuador and Uganda about the diseases that have been affecting his field of faba beans.

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A key starting point for the project has been the development of a set of participatory tools to capture and understand farmers' knowledge and practices for managing pests and diseases using local crop varieties. "Tapping into farmer knowledge is important for us to be able to find solutions that suit local needs and the local environment," said Jarvis.

This adds a new dimension to work on pest and disease management, which has commonly focused on only three components: host, pathogen and environment. "The project will ensure that the fourth, critical component—the farmer—is also included," says Jarvis.

The participatory diagnostic tools the project will employ include detailed guide questions that help to acquire such information as when and where intra-specific diversity can help to manage pests and diseases and to identify the 'genetic choices' farmers make to minimize losses caused by pests and diseases. The tools are now available in Chinese, Spanish and French, as well as English, and plans to translate them into Arabic are well advanced. Many of the tools build on successful participatory techniques developed during a global project on the *in situ* conservation of agricultural biodiversity run by Bioversity (see *An improved tool to assess local crop diversity*, Annual Report 2005, p. 10).

The next challenge will be to develop guidelines for laboratory and field assessments that build on this knowledge. Trials in farmers' fields will be organized to assess the disease and pest resistance of traditional varieties and trials in experimental stations will allow researchers to follow epidemics over time and to observe impacts on yields.

"Integrating the knowledge, beliefs and practices of farmers with advances in the analysis of crop and pest and disease interactions will help increase farmers' options for fighting pests and diseases in a sustainable way," concluded Jarvis.

Further information

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