The first results have shown that pest dynamics can be managed better with the use of fallowing or rotation with pineapple, sugarcane or forage crops. Fallows may be left to natural grassland, or sown to cover crops or beneficial plants including species with a nematicidal effect such as Tagetes or Eupatorium. These practices have two potential effects: by reducing pest pressure they reduce pesticide load in the field, and they can reduce pollution load in the watershed as a whole because fallow land and rotation crops such as sugarcane require little pesticide. When the banana crop is growing, a mulch of plant material can be laid or a shade-loving intercrop such as Mucuna decubens or Impatiens spp. can be grown. Combined with the use of tissue-cultured nursery plants, these practices provide better pest control, but they must be carefully designed to avoid all risk of invasion. Dissemination of new banana varieties with improved resistance to pests would complement this approach, providing greater intraspecific diversity while also diversifying the supply to consumers.

The sustainability of the banana plantations in future will depend on our ability to design agroecological innovations. To improve the functioning of such ecosystems, we need to know more about the interactions between crops, wild plants and pests and diseases. Several teams are working to design and assess multi-species cropping systems, particularly agroforestry associations, on the hypothesis that a system with a combination of species is more sustainable. Integrating such systems at farm level is an essential stage towards their adoption. Analysis of the impact and optimisation of the spatial arrangement of these systems at catchment level will be a final stage which could lead to effective environmental risk management.

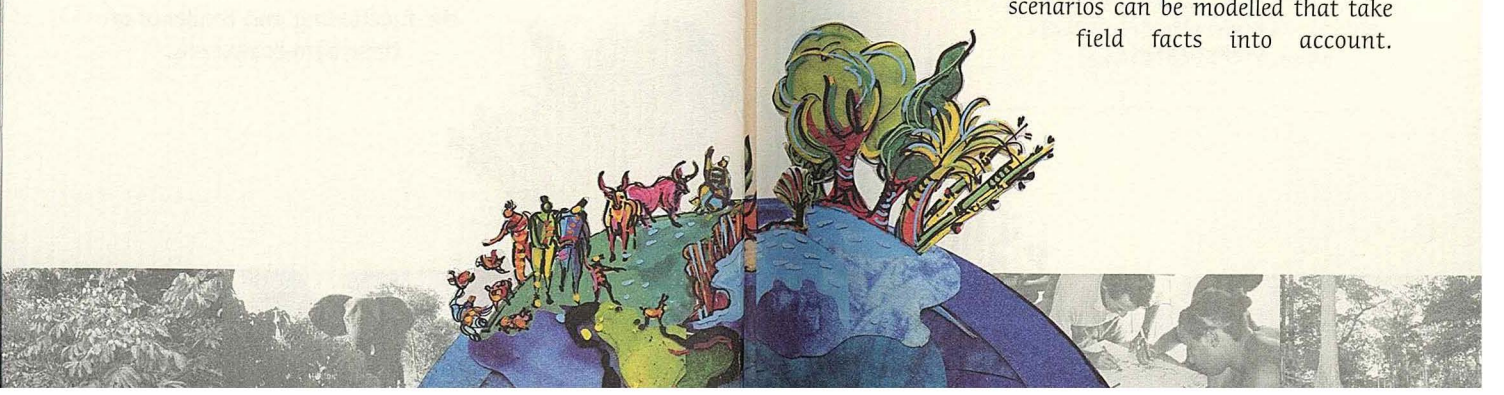
Agrobiodiversity of sorghum in Burkina Faso and Mali

CIRAD and a number of partners are working in Mali and Burkina Faso in a project on agrobiodiversity in West Africa sorghums, with support from the FFEM.

One problem facing sorghum farming in these countries is the extinction of local varieties and the farming knowledge associated with them. Although sorghum is important for the Sahel, there is little adoption of selectively bred varieties. Yields of local varieties are stagnating and there is competition from maize, which responds better to more intensive cropping techniques.

The purpose of the research is to preserve sorghum diversity and, with local participation, intensify its use in order to increase yields. The approach is multi-disciplinary (genetics, ecosystems, sociology) and partnerships are formed between research, farmers' organisations and development institutions. The project has a regional dimension, covering sorghum farming areas of different types.

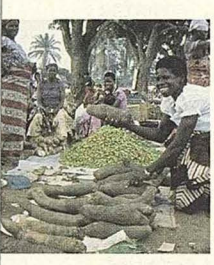
The management component of the research emphasise improving knowledge of farmers' decision-making process to choose sorghum varieties. Adapted farming systems and seed exchange procedures are also studied. From the data gathered, scenarios can be modelled that take field facts into account.



Diagnostics of sorghum-based cropping systems are performed in order to assess farmers' need for sorghum varieties. To achieve this, sorghum populations are developed from local genetic resources and evaluated in situ.

Expected results are an inventory and characterisation of local varieties and genetic erosion mechanisms, and an improved knowledge of sorghum biodiversity in farming systems, as well as its spatial distribution in ecosystems. Also studied are socio-economic constraints, characteristics of traditional seed systems, and social factors in the adaptation and distribution of varieties. With stronger farmers' organisations and knowledge of the consultation procedures used among stakeholders in the sorghum commodity chain, strategies for the conservation and use of sorghum biodiversity can be improved.

Preliminary results have been achieved with a number of accessions collected and assessed in Mali and Burkina Faso and with analysis of the main cropping systems. Several populations of sorghum are currently being monitored in situ. The researchers have also shown that a spatial model accounts for the relative abundance of varieties in local areas, and that varietal diversity is not managed at farm level but within groups of farmers exchanging seeds.



• There is a large number of cultivated yam species and some have been "domesticated". In Africa, producers find and farm wild species that meet their requirements. In some cases, they obtain new varieties directly from the wild stock. Scientists try to understand farmers' practices and the relations between wild and cultivated yam species.

Dynamic management of agrobiodiversity in root and tuber crops

While yields of major cereal crops have reached a ceiling, roots and tubers such as cassava, sweet potato, yam, taro and macabo offer promising prospects for food security. Grown on small plots by the poorest farmers, they are found everywhere in the intertropical zone, but there are few representative collections of their genetic diversity. There is a risk of genetic erosion, and farmers will need to manage the agrobiodiversity of these crops dynamically.

Subsistence farming in the South Pacific is based on root and tuber crops. In Melanesia, consumption of fresh tubers is the highest in the world: 350 kg per person per year. Melanesia is also a region of great genetic diversity, both for the number of species and for the number of cultivars per species. Some species are endemic, others were introduced when the first contacts with Europeans were made. Melanesian farmers do not sow seeds because the varieties they grow are sterile and are propagated vegetatively; this makes them vulnerable to environmental changes.

The project CIRAD is taking part in Vanuatu aims to establish an agrobiodiversity management system for nine root and tuber species, run by farmers. It proposes dynamic management rather than static conservation of existing genetic resources. It does not have the constraints in situ collections suffer from and it offers a partial solution to the narrow genetic base existing in plantations.

The proposed research objectives include recording local knowledge, inventorying existing varieties and their genetic diversity, participatory assessment of varieties and working out a methodology that can be used in other countries. It is hoped that by the end of the research, the farmers will possess an abundant allelic diversity that will enrich their range of varieties without endangering existing ones. In this way they will be forearmed against possible changes in the environment or climate.