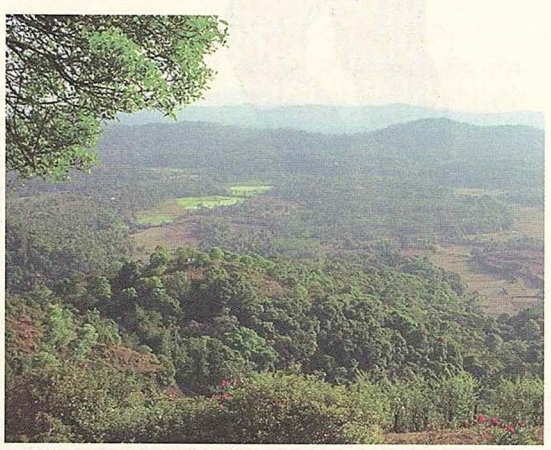
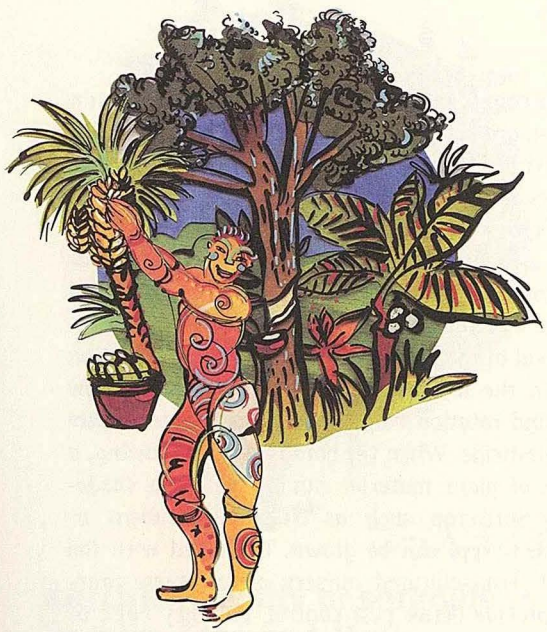
management in ecological processes that have their own levels of organisation. There is no ideal scale for studying interactions between the landscape and its stakeholders; a multi-scale approach is needed. This means deploying and integrating numerous disciplines and tools including the biological sciences (landscape ecology, ecosystem ecology), ethnosciences (anthropology, economics of natural resources, ethnobotany, human geography, sociology), remote sensing, information systems, spatial analysis, modelling.



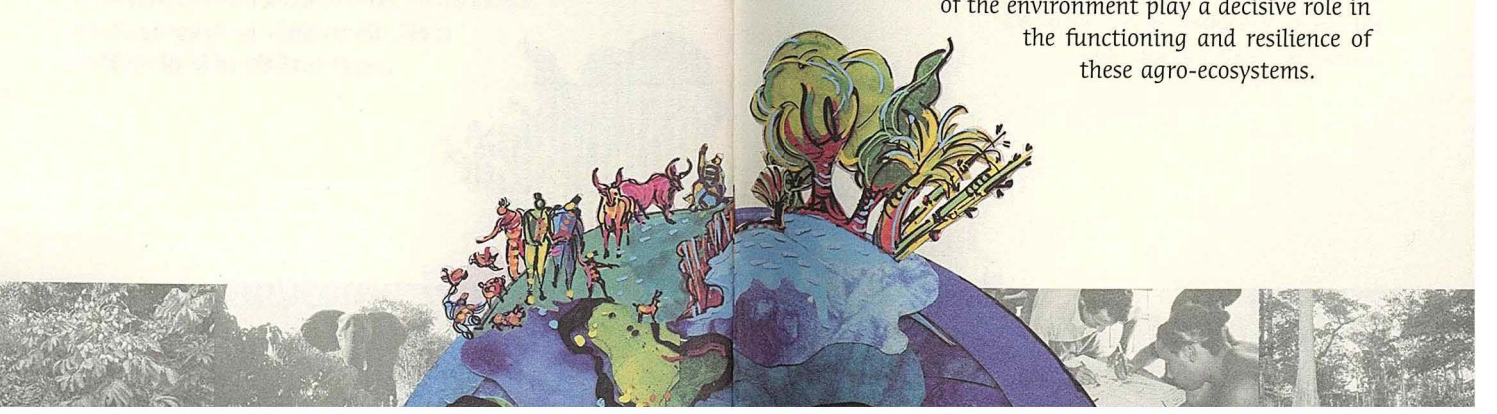
• *Raja's Seat in Madikeri, Kodagu district, Karnataka, India is a complex landscape combining rice fields, dense forest and agroforest. A model of biodiversity management.*



Reintroducing biological diversity in monocrop banana plantations of the French Antilles

In the French Antilles as in many other countries, bananas for export are grown in single-variety plantations under heavy pressure from three pests: Mycosphaerella musicola, a fungus that causes Sigatoka disease, Radopholus similis, a nematode that causes root and bulb necrosis, and Cosmopolites sordidus, a boring insect whose larvae do serious damage to the bulbs. Large quantities of pesticides are used on banana plantations, some of them highly persistent, with the result that soils and water are heavily polluted.

Solutions are needed to make banana growing both economically viable and ecologically acceptable. CIRAD and its partners in the French Antilles are working to reintroduce more biological diversity in these monocrop systems, as a credible alternative to large-scale use of pesticides. The many interactions between cultivated plant, pests and the components of the environment play a decisive role in the functioning and resilience of these agro-ecosystems.



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.