

# *les dossiers* d'**AGROPOLIS** INTERNATIONAL

*Expertise of the scientific community  
in the Languedoc-Roussillon region (France)*



## Family farming



## Modelling interactions between ecological and social dynamics

The internal research unit *Management of Renewable Resources and Environment* (UPR GREEN, CIRAD) uses systematic and interdisciplinary approaches to address the issue of the co-viability of ecosystems and the livelihoods they support. Interactions between ecological and social dynamics are the main focus. The aim is to understand how these interactions question collective decisionmaking processes and how nature is appropriated in a sustainable development setting. Studies carried out since its founding in 1994 have highlighted the construction of an interdisciplinary approach to study topics—social, agronomic and ecological sciences, and informatics—where modelling is an intermediation process between different types of knowledge.

With a 'management of common resources and the environment' entry, the unit focuses on a broad range of different resources (water, forests,

land, fisheries, etc.) on various scales (village to region, sometimes even country). It conducts cross-sectoral analyses on biodiversity, land-use changes and conservation/usage arbitration, natural and renewable resource access and modes of appropriation. This Montpellier-based research unit is also involved in research in West Africa, the Indian Ocean, Southeast Asia, Central and South America.

UPR GREEN was a pioneer in the development of participatory modelling approaches (ComMod, Companion Modeling) to support local stakeholders (farmers, managers, politicians, etc.) on renewable natural resource management, based on its own modelling platforms\*. The researchers are thus highly involved in institutional arrangements that accompany public decisionmaking processes on local, national and even international scales (Madagascar and Senegal on land, Bhutan, Burkina Faso and Ghana on water, Latin America and West Africa on agrobiodiversity).

The unit focuses on the family farming issue via several entries, including agriculture multifunctionality and rural household pluriactivity. It is essential to characterize the heterogeneity of socioecological stakeholders in the modelling process, as well as the differentiation of agricultural systems through an analysis of transitions, crises and agricultural transformations that describe family farming trajectories. This analytical framework for family farming applies to individual/collective water management, the management of local varieties in seed systems, the resilience of family farms under the risk of climate shocks or soil degradation, the link between income insecurity and food security, the ecological dynamics of newly cleared land in the Amazonian region regarding the family farming trajectory, etc. ...

\* CORMAS platform: Natural resources and multiagent simulations

MIMOSA platform: Computer and Modelling Methods and Simulation Agents



▲ Participatory characterization of local varieties, Kaniko, Mali.

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## Enhanced production and seed access for family farmers

Access to a variety of high quality seeds for a broad range of species is a major challenge for African family farms, from the food security and climate change

at supporting family farming stakeholders in a participatory improved variety selection and seed dissemination process, and at studying the impact of introducing new varieties on the biodiversity dynamics of studied species.

Innovative tools were used to develop a participatory modelling approach applied to seed systems. Multi-agent models incorporate stakeholders' viewpoints and simulate scenarios involving changes in practices to analyse their impacts on biodiversity dynamics, with the ultimate aim of collectively designing new agrobiodiversity management strategies. The characterization of varietal diversity in local cropping systems is discussed to be able to assess system changes according to different scenarios. These scenarios are useful to, for instance, discuss the location of certain minor sorghum varieties (in terms of cropping area and number of farmers that use them) according to the type of farm and risk of genetic diversity loss. Workshops conducted in Mali led to the registration of plant varieties in the national catalogue to enable the extension of sorghum varieties collectively obtained by participatory selection.

Didier Bazile, [didier.bazile@cirad.fr](mailto:didier.bazile@cirad.fr)  
Kirsten vom Brocke, [kirsten.vom\\_brocke@cirad.fr](mailto:kirsten.vom_brocke@cirad.fr)  
Danièle Clavel, [daniele.clavel@cirad.fr](mailto:daniele.clavel@cirad.fr)  
& Dominique Dessauw, [dominique.dessauw@cirad.fr](mailto:dominique.dessauw@cirad.fr)

For further information: <http://imas.agropolis.fr>

The 'Sustainable management of agricultural biodiversity in Mali' (FFEM, 2010-2013) and 'Impact of seed access arrangements on genetic diversity dynamics in agriculture' (ANR, 2008-2012) projects conducted by UPR GREEN and UMR AGAP were aimed