

les dossiers d'**AGROPOLIS** INTERNATIONAL

Expertise of the scientific community



Societies and sustainable development

Contribution of the social sciences

Number 7

AGROPOLIS INTERNATIONAL

agriculture • food • biodiversity • environment

Agropolis International brings together institutions of research and higher education in Montpellier and Languedoc-Roussillon in partnership with local communities, companies and regional enterprises and in close cooperation with international institutions. This scientific community has one main objective—the economic and social development of Mediterranean and tropical regions.

Agropolis International is an international space open to all interested socioeconomic development stakeholders in fields associated with agriculture, food production, biodiversity, environment and rural societies.

Agropolis is an international campus devoted to agricultural and environmental sciences. There is significant potential for scientific and technological expertise: more than 2 200 scientists in more than 110 research units in Montpellier and Languedoc-Roussillon, including 300 scientists in 60 countries.

Agropolis International is structured according to a broad range of research themes corresponding to the overall scientific, technological and economic issues of development:

- Agronomy and Mediterranean and tropical agricultural production sectors
- Biotechnology and food technology
- Biodiversity, natural resources and ecosystems
- Water, environment and sustainable development
- Societies and sustainable development
- Genomics and integrative plant and animal biology
- Food and health
- Food quality and security

Agropolis International promotes the capitalisation and enhancement of knowledge, personnel training and technology transfer. It is a hub for visitors and international exchanges, while promoting initiatives based on multilateral and collective expertise and contributing to the scientific and technological knowledge needed for preparing development policies.

Societies and sustainable development research expertise in Montpellier and Languedoc-Roussillon

Agriculture and the environment are at a global crossroads. As globalization and regional inequalities between regions advance, the futures of world agriculture can no longer be contemplated on a solely sectorial basis in a nation-state setting. Moreover, societies relationships with natural resources and the environment have to be reconsidered in the light of crucial environmental issues. With the rapid changes that have taken place in recent years, common resource governance strategies are now in question, especially as the agricultural and environmental aspects become increasingly overlapped.

Two major shifts recently altered viewpoints and ways of considering agriculture and relationships that societies have with the environment. They will have a growing impact on the organization of farming and food systems on a global scale. The first shift took place in 1994 with the Marrakesh Agreement, the founding of the World Trade Organization (WTO) and the inclusion of agriculture in the free trade agenda. The second shift occurred in the early 2000s, with the importance of collective issues on sustainable management of common resources and the environment being confirmed worldwide. They highlight the fragility of the biosphere and the increasing interdependence of global interactions symbolized by climate change.

In response to these changes, agricultural and environmental research is being called upon to address crucial issues concerning food security, sustainable resource management and socioeconomic development of human communities.

Social sciences are involved in generating knowledge on these changes, gaining insight into the driving factors and boosting the awareness of public policy negotiators.

Interaction between social, agricultural, biological, engineering and information sciences is essential for the success of these strategies.

As part of the *Université de Montpellier Sud de France* initiative, Agropolis International pools 24 multidisciplinary research units focused on these topics, including around 700 researchers and teacher researchers supervising 500 PhD candidates. They form four thematic units that represent pivotal points whose boundaries are flexible due to the complexity of the phenomena involved and global interdependence.

Societies and sustainable development

Contribution of the social sciences

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World agriculture— *a key challenge* for societies

Agriculture has, historically, always been a key factor in social and political issues. Although its economic role in developing countries has diminished considerably, agricultural and rural concerns with respect to food security in both developed and developing countries, food safety, human health, land and natural resource management are still topical in a world of scarce resources that is now 'set' and marked by increased interdependence.

These issues have long been managed on a nation state level. They are now, however, dealt with in an international setting marked by a globalization process that is unprecedented in the history of agricultural societies. The latter are now faced with disproportionate competition with faraway production systems. These have differing technological levels and their potential for meeting standards set by major economic stakeholders (multinational agricultural suppliers, agrifood companies and large-scale distributors) and public authorities (European Union, USA, etc.) are highly varied. Moreover, consumers seek to be reassured about the quality of products imported from often remote, but sometimes nearby, production areas.

Human activities now have such marked impacts on the biosphere that they warrant consideration in technical and economic assessments. Scientific, technical and economic models underlying agricultural policies in the 20th century which led to production intensification are now challenged. Criteria used to assess their performance should be reevaluated within the scope of sustainable development. Moreover, public policies require updating in the current international setting, marked by the geographical reconfiguration of agricultural production, strengthening of World Trade Organization (WTO) interventions and a shift of some

so-called emerging countries (China, Brazil, India, South Africa) into the foreground.

The future positions and roles of agriculture, the agrifood system and the rural sector with respect to the development of economies, ecosystems and societies are at stake here.

Food production is still crucial for agriculture and the rural sector, but there is growing demand for other functions: production of biomass-energy and plant raw materials (edible and nonedible) for high-tech industries, *in situ* biodiversity conservation, carbon storage, and sustainable water resource management. In addition, agriculture is still the top employment sector worldwide, but the employment situation could be worsened if 'conventional' modernization initiatives are continued.

Agriculture is currently in a paradoxical position. It is a strategic challenge with respect to the Earth's future and is returning to the forefront because of its many roles for the environment, natural resource management, energy, health, biodiversity and culture, in addition to its nurturing role. On the other hand, public investment in agricultural and rural sectors has declined considerably in the last 30 years. Many operators with different interests and highly unequal action capacities (multinational companies,



Harvesting barley

I. Touzard © Montpellier SupAgro

local communities, environmental nongovernmental organizations (NGOs) are now on a podium that was formerly solely occupied by agricultural operators, so new forms of public action are required. Paradoxically, current assistance and cooperation policies question the prominent position of the rural sector, whereas in most developing countries this sector is still hampered by high population growth rates, and there are few employment opportunities outside of the agricultural sector.

In this setting, new social science challenges are arising, so research is required to gain insight into the changes under way, to highlight contradictions and controversies, to generate clear knowledge that will be useful for hands-on agricultural and rural applications. Social sciences will be called upon to an increasing extent to assess the compatibility of technical progress with ethical

and moral principles under the socioeconomic conditions of its implementation in agrifood systems.

How can agriculture help to reestablish global balances in terms of employment and migration, land and natural resource management, production and management of global public goods (carbon, water, biodiversity, etc.)? What new governance conditions will be required on different levels to promote changes in individual and collective practices?

In the coming decades, innovations will have to be implemented to ensure food security, reduce greenhouse gas emissions, preserve biodiversity, etc. In this setting, with marked tensions between sometimes contradictory objectives, limited resources and increased asymmetries between stakeholders (multinational corporations, farmers and countries), what will be the respective roles of

states, international organizations, civil society representatives, and especially farmers and rural communities to foster the adoption of new tailored practices? How could research analyse the necessary changes and help monitor them in the long run?

**Pierre-Marie Bosc
(CIRAD)**



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An apple orchard in the Haut-Atlas region (Morocco)

Territorial dynamics *and changes in* production systems

Rural societies are now undergoing rapid change in their environment, thus affecting their communities, resource allocation, economic activities and land use patterns. Trade globalization is also impacting these societies by fostering competition between all regions and forms of agriculture. With the withdrawal of government support, local operators are striving to coordinate their efforts for rural land management. Tensions between globalization and emerging local governance is a new focus for research on territorial dynamics and changes in production systems. Globalization has boosted interactions between regions and agriculture in developed and developing countries, without altering the specificities. On a regional scale, rural functions are being diversified in different ways depending on the local features of rural areas, while giving rise to specific territorial functionalities and new sources of wealth (tourism, etc.), but the agricultural footprint is still quite marked. Production systems are also changing in a specific way.

In the South, export commodity channels and increased urban demand for food products has revitalized local production systems. Family farmers are nevertheless still hampered by a lack of effective extension services and farmers' organization weaknesses. In emerging countries, capitalist mechanized agriculture prevails and benefits from relatively low labour costs. Population growth and competition between family farmers and commercial farmers have increased land tensions. This often forces small-scale farmers to give up their land because of their lack of economic viability and could push others to intensify their farming systems. In this setting, which is worsened by the decline in natural resources required for agriculture, the sustainability of production systems, territories and thus rural societies is becoming a crucial issue.

In the North, the situations differ depending on the extent of public support for agriculture and land availability—there are vast areas in Argentina, USA and Australia where extensive agriculture is possible and agrofuels can be produced. Western Europe has begun changing its agricultural systems with the aim of preserving a high level of production, enhancing food quality, broadening the range of products, and especially reducing the negative externalities of agriculture. This new policy is also focused on resource and land use

management, employment and rural services in order to give rise to local development dynamics that will force farmers to collaborate with other rural stakeholders. In less productive areas, farmers diversify their activities (processing and direct farm sales) or strive to increase the size of their farms so as to remain competitive in a setting marked by a reduction in European subsidies.

Teams conducting research on these topics focus on the development of family agriculture which they feel represents a more sustainable model than commercial agriculture because of its innovation and adaptation capacities that, in turn, should be supported. Innovation should enhance the sustainable development of agriculture, farms, processing units and rural areas, while improving the well being of the operators involved. Both technical and organizational changes in farming practices are thus required. The organization and coordination of rural communities with upstream and downstream production operators and with local authorities seems important. This coordination should boost recognition of product quality, improve commodity channel performance, facilitate fair profit sharing and enable dispute arbitration by groups.

New concerns will arise in the next 20 years with changes in rural, agricultural and agrifood economies influenced by climate change and increased fuel prices.

Over the last few decades, researchers focusing on agricultural, rural and territorial dynamics have been implementing multidisciplinary and comparative approaches to gain insight into, measure and explain the changes under way. They have diagnosed the situation and conducted analyses to provide guidelines for decision makers. Research is now also involved in implementing and supervising innovation processes. For this partnership research, nonresearcher stakeholders must be recognised as participants in the innovation research and design process. Methods and tools such as surveys, diagnoses, experiments, modelling and action research are thus used as part of a partnership approach to produce general knowledge, facilitate problem solving and enhance mutual learning amongst participants.

**Patrick Dugué (UMR INNOVATION)
& Anne-Marie Jouve (UMR MOISA)**

Territorial dynamics and changes in production systems

Main teams

FRE CNRS 3027 - MTE
Mutations des Territoires en Europe
(CNRS, UM3, UPVD)
28 scientists, 28 PhD candidates
Director: Geneviève Cortès,
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**EA 3766 GESTER Gestion des sociétés,
des territoires et des risques**
(UM 3)
20 scientists, 36 PhD candidates
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UMR INNOVATION
**Innovation and Development in the
Agriculture and the Agrifood Sector**
(Montpellier SupAgro, INRA, CIRAD)
46 scientists, 15 PhD candidates
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**UPR Livestock Systems and Animal
Product Management**
(CIRAD)
33 scientists, 11 PhD candidates
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UMR TETIS
**Spatial Information and Analysis
for Territories and Ecosystems**
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**US 140 ESPACE Expertise et spatialisation
des connaissances en environnement**
(IRD)
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Analysis and understanding of territorial processes

The *Mutations des territoires en Europe* unit (MTE, FRE – CNRS 3027) is a laboratory of the Humanities and Social Sciences department (CNRS, UM3, UPVD) that conducts research to analyse and gain insight into territorial processes. The scientists of this unit develop research approaches in the fields of geography, landuse planning and territorial economics.

MTE includes geographers and economists and closely collaborates with the team of the *Centre d'étude et de recherche sur les qualifications* (CEREQ) in Montpellier. The research benefits from a network of collaborations and partnerships with several research institutions based in Montpellier (IRD, Montpellier SupAgro, etc.), France, in addition to around 30 universities and research centres abroad.

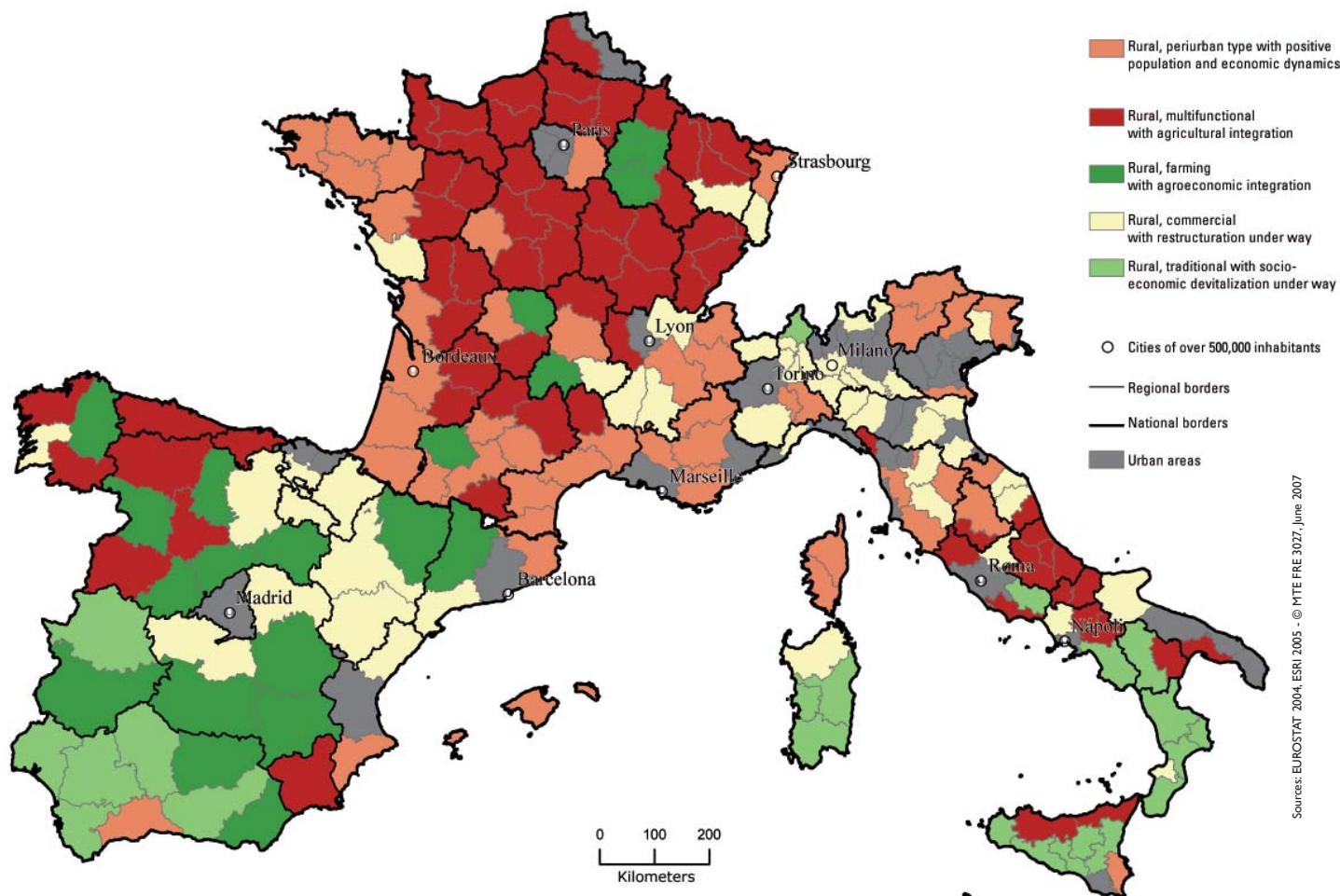
The unit has long-standing research expertise in European areas and conducts multifaceted research on Western, Central and Eastern Europe, while also expanding to more southern geographical areas: Middle East, Mediterranean, Latin America, etc.

The laboratory's research activities are organized along three lines:

- Territorial development, environment and ruralities
- Mobilities, networking and exchanges
- Policies and inhabitants' practices in territorial codevelopment.

The research programmes are as follows:

- Territorial functions and rural dynamics in Western Europe (2007-2010)
- New trajectories of international Latin American migration in Europe. A case study of Andean migrants in Spain (2007-2010)
- Governance and local development in Central Europe (European programme, PICS – International Scientific Cooperation Projects – 2008-2010)
- Emergence of quinoa in global food trade: what are the impacts on social and agricultural sustainability in the Bolivian Altiplano region? (Agriculture and sustainable development ANR – French Research Agency – programme, 2007-2009)
- Risks and disparities concerning sustainable water resource management (CRIQUE programme, 2006-2009)
- Usage and neighbourhood disputes in rural and periurban areas (when the disputes last...), Agriculture and sustainable development ANR programme, 2007-2009).



Dynamics of rural regions in France, Spain and Italy

Variables involved: predominant rural functions (typology 1), population and socioeconomic dynamics (typology 2), socioeconomic integration (typology 3)

Territorial functions and rural dynamics in Western Europe

Since the 1980s, the Western European rural community has been marked by major socioeconomic changes associated with globalization and free trade policies. Many innovations have been produced in all fields. However, the main consequence of changes in the rural area is clearly the gradual shrinkage, on a European scale, of a monofunctional rural world dominated by agricultural activities and societies. In Europe, agricultural patterns are still marked by substantial spatial differences, with the concentration and relocalisation of dominant types of production and the emergence of new territorial production patterns.

The aim of the project carried out by the *Mutations des territoires en Europe* unit (MTE, FRE CNRS 3027) in association with the Institute of Economics and Geography of the *Consejo Superior de Investigaciones Científicas* of Madrid (Spain) and the Rural Geography Laboratory of the University of Bari (Italy), is to reassess the diversity of rural functions through a comparative analysis involving several Western European countries (Spain, Italy, France).

The main aim of the project is to understand how socioeconomic and spatial change is currently taking place in rural areas within the scope of accelerated trade globalization.

This involves three lines of research:

- analysis of spatial differentiation processes under way on national and infranational scales
- assessment and interpretation—on the basis of the territorial trajectory concept—of reconstructions affecting rural areas, on local and regional scales, through the analysis of factors that explain the different territorial dynamics
- prospective analysis to determine possible change scenarios in rural areas.

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Rural territory emergence processes in Mediterranean countries



Produce market in Fkih Ben Salah (Morocco)

This research project is focused on territorial development. North Africa is a textbook example that may be beneficial to study within the Mediterranean Basin. We thus decided to conduct a comparative analysis of rural territorialization in North Africa with that in France, while also highlighting two complementary points with three Mediterranean countries of the European Union

(Greece, Italy, Spain), two Middle Eastern countries (Lebanon, Egypt) and two non- (European Union) countries (Albania, Turkey).

This choice was mainly instigated by the presence of the Réseau Agricultures Familiales Comparées (RAFAC) that IAMM, Montpellier (France), coordinates and has been carrying out comparative analyses in the Mediterranean area for several years. The emergence of territories will be analysed in each country on the basis of three criteria: the extent of deconcentration and decentralization, the presence of local operators, and the existence of socioeconomic activity areas. This threefold approach should help to address the question of how rural territories emerge in the 11 studied countries and to determine the explanatory factors of this emergence process. A comparative analysis is thus required to both identify and explain the constant factors and observed differences between countries. The entire project is being conducted within a dual cooperation framework, including cooperation between confirmed researchers and between researchers and PhD students from the different countries that have come forward as candidates to work in this project.

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Other teams focused on this topic

UMR MOISA Markets, Organizations, Institutions and Operators' Strategies

(Montpellier SupAgro, CIHEAM/IAMM,
CIRAD, INRA, IRD)

58 scientists, 29 PhD candidates

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EA ERFI

Équipe de recherche
sur la firme et l'industrie
(UM I)

32 scientists, 40 PhD candidates

Director: Frédéric Le Roy,
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www.erfi-management.net

UR 199

Dynamiques socio-environnementales
et gouvernance des ressources
(IRD)

30 scientists, 15 PhD candidates

Director: Geneviève Michon,
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UMR G-EAU

Water Resource Management,
Actors and Uses

(AgroParisTech/ENGREF, CEMAGREF,
CIHEAM/IAMM, CIRAD, IRD, Montpellier SupAgro)

35 scientists

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www.g-eau.net

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Territorial management and effective governance

The *Gestion des sociétés, des territoires et des risques* host team (GESTER, UM3) conducts research on territorial management. This primarily involves assessing territorial dysfunctions and reconstructions, especially in the framework of new regulatory provisions. Natural or social, political or economic, cultural or regulatory constraints must be predetermined in order to ensure effective territorial governance. The analysis is meant to update methods for collective territorial development. It should therefore contribute to finding the best territorial consistency in an environmental setting that societies wish to preserve and protect. Long-term interactions between humans and the environment must be taken into consideration in analyses on the creation of territories and their functioning. In the light of prospects for sustainable territorial development, short-term concerns

of development stakeholders must be matched with the slower but more profoundly changing environmental and sociocultural frameworks and patterns.

In this setting, GESTER conducts research in two key areas:

- Urban and territorial governance
- Risks, territorial organization and sustainable development.

The following programmes are under way:

- Water access and sustainable development in Tétouan (Morocco). Methodological contribution to account for individual liberties in human development
- Mediterranean atlas of catastrophes and natural hazards
- Convention between Mentouri University in Constantine and the University of Montpellier 3 (UM3)
- Development of natural and anthropogenic risk indicators for the *Observatoire du Développement Durable en Méditerranée*

- Impact assessment on the implementation of flood risk prevention regulations
- Developing outskirt cities. Territories and territorialities in large North African cities
- Inondhis: regional analysis of historical floods in Languedoc-Roussillon (France)
- A small-scale local factory in a sustainable urban development framework. From planned construction to the implementation of quality-assured projects, a North-South comparison of issues involved in four large cities
- Participation in the international TSUNARISQUE project
- Urban and rural territories in the Constantine region: changes and governance.

GESTER is active in France, the Mediterranean region, North Africa, the Middle East, sub-Saharan Africa, in coastal regions, on islands and island states, in Southeast Asia and the Lesser Antilles.

Agricultural and agrifood innovations—individual and collective action processes

The joint research unit (UMR) Innovation and Development in the Agriculture and the Agrifood Sector (Montpellier SupAgro, INRA, CIRAD) conducts research in France and abroad on innovation processes, which are considered as individual and collective action processes on technical and organizational scales. It focuses on all processes, from stakeholders' innovation objectives to development impacts induced by these innovations. The research team has expertise in biotechnical (agronomy) and social sciences (economy, sociology, anthropology, geography, management science and law). It is jointly involved in a multidisciplinary research programme to investigate innovations through studies of processes actually under way.

These processes are analysed with respect to the conditions of stakeholders' involvement, focuses of action and their patterns. The researchers participate in changing the target of these actions and the configuration of stakeholders involved in the process.

This UMR focuses on the discrepancy between individual decisions and collective innovations, which involves investigating decision-making, coordination, collective action, activity system, subsector, territorial and knowledge concepts. The unit's research project is at the interface of these four dimensions, i.e. individual, collective, horizontal (activity systems, territory construction) and vertical (product quality and market construction).

The UMR consists of three teams:

- Technical and organizational changes in agricultural production systems: analysis of change dynamics on farms ...

Changes in practices on mixed cropping-livestock herding farms in African savanna regions and farm advisory support systems



A Kapsiki farming family in the village of Kila, in the Mandara Mountain region, northern Cameroon

Farming practices have changed on mixed cropping-livestock herding farms in sub-Saharan Africa due to the increase in the rural population and thus to the reduced access to productive natural resources. Moreover, there is little collective organization of these family farms to enable them to fulfil market expectations and cope with the commercial practices of stakeholders upstream and downstream of the production chain. Head farmers should thus adapt quickly by changing their production systems and tailoring their practices, whereas standard technical innovation design and transfer approaches in rural areas or in relation to commodity chains have shown their limitations.

In addition, farmers should be supported with respect to managing their farms and to their decision making in order to make optimum use of the resources at hand.

Research projects are carried out in collaboration with these farmers and their partners with the aim of developing tools and methods to provide technical, economic and organizational support for family farms and meeting the expectations of these operators. The scientific target of this research is to highlight factors that determine changes in practices and the genericity of the tool and method design process. This involves three research strategies:

- detecting and gaining insight into changes in practices by including endogenous innovation processes
- designing management tools that can be used by farmers to boost their operational and decision-making capacities for their farms
- developing a farming advisory system based on research geared towards finding alternatives to conventional extension schemes ('salesman extension agent'/farmer) by developing training and group counselling strategies, promoting agricultural socioprofessional networking, with the emergence of a coordinator/trainer function held by a farmer in basic groups.

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- Social construction of markets, qualities and territorial development: analysis of product and market dynamics
- Territorial innovation: analysis of territorial dynamics.

The research unit analyses technical and organizational changes in agriculture and the agrifood sector:

- by combining sector-based and local approaches with a global analysis (international and societal)
- by accounting for territorial dynamics and their new forms of governance
- by reexamining the question of ultimate aims and responsibilities (innovation-development relationships).

Study of transformations in livestock production and farming systems in developing countries

The internal research unit (UPR) Livestock Systems and Animal Product Management (CIRAD) has to deal to an increasing extent with the impact of changes induced by globalization and regulation of the trade of animal products and on-

the-hoof livestock on the viability of production systems and the sustainable development of regions where herding prevails. In developing countries, the current high demand for animal products provides a market opportunity for livestock farmers and could help them meet challenges with respect to competition from imported products, fulfilling consumer requirements for top quality products, and stiff competition for resource access.

The research unit's social science research is being carried out within the scope of multidisciplinary research programmes aimed at analysing complex changes in livestock production and farming systems and in herding regions.

These studies are partially based on a systems approach to livestock farmers' strategies within a family-based social organization, and also on socioeconomic-type analyses to jointly assess livestock farming, natural resource and land management, and animal product marketing practices.

Analyses on family farm or herding region scales are performed using mapping models, streamlining

models and econometric methods to gain insight into the likely effects of external changes on the viability of farming systems and the social and environmental sustainability of herding regions.

Socioeconomic methods are implemented to assess the ecological intensification of livestock production systems in relation to the socioeconomic organization of household activities and local know-how, market constraints and opportunities and potentials and constraints associated with resources and how they are managed.

Spatial information to benefit environmental management and territorial development

The joint research unit (UMR) Spatial Information and Analysis for Territories and Ecosystems (TETIS, CEMAGREF, CIRAD, AgroParisTech-ENGREF) conducts research on methods for managing spatial information to benefit environmental management and territorial development. Methods are developed on the basis of expertise in the fields of remote sensing,

Other teams focused on this topic

UPR 36

Forest Resources and Public Policies
(CIRAD)

23 scientists, 13 PhD candidates

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URP 68 Pastoralism

(CIRAD, ISRA, ENEA, UCAD, CSE)

17 scientists, 6 PhD candidates

Director: Amadou Tamsir Diop (ISRA),
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Administrative Head (CIRAD):

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UPR 22 AGIRS

Animal and Integrated Risk Management
(CIRAD)

27 scientists, 8 PhD candidates

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UPR ARENA

Collective Action, Policies and Markets
(CIRAD)

21 scientists, 6 PhD candidates

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LEAD-LCL initiative: Livestock in a Changing Landscape

The Livestock, Environment and Development (LEAD) initiative involves several international institutions and donors working towards rural development. It is now coordinated within the Food and Agriculture Organization of the United Nations (FAO). Livestock in a Changing Landscape (LCL) is one of the many LEAD activities currently under way. LCL is an overall analysis of changes in livestock production systems in the contemporary world and of the predicted environmental impacts. The aim is to provide guidelines for drawing up livestock production policies to promote sustainable development. CIRAD (especially URP 68 'Pastoralism') is actively participating in this analysis with respect to extensive herding in hot regions on all continents. Following an international meeting that was held in Bangkok in November 2006, where the work of some 40 scientists was presented and submitted to livestock production managers of various origins, several scientific papers and livestock production policy guidelines will soon be published.

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For further information: www.virtualcentre.org



Family herd returning from grazing in a cotton-growing area (Mali)

ICARE thematic research project:

impact of the opening-up of markets on territorial development in livestock production regions of developing countries



The emergence of rural mini-dairies, whereby milk is collected daily from farmers, thus ensuring their inclusion in marketing channels (here close to Kolda, Senegal)

International trade agreements forced most developing countries to lower their customs barriers. Is there a risk that these trade regulations will marginalize some livestock farmers? Few field studies have been carried out to document this process. The aim of this project was to gain insight into the impact of market opening policies on the location of livestock farming activities and thus on territorial development dynamics. The main working hypothesis is that current trade policies lead to territorial imbalances when they are not offset by other types of public action.

This hypothesis is being tested via the project in selected fields in West Africa (ECOWAS zone) and East Africa (IGAD zone). Economic integration and market opening policies have been applied in recent years in these two regional units and seem to be having a substantial impact on the livestock production sector. Several scales are involved: regional units, countries, production areas and farms.

The methodological challenges concern integration of the 'market access' concept in territorial development approaches (including land and resource management and social organization concepts). This is based on different evaluation instruments, ranging from mapping tools to mathematical modelling of farmers behaviour and analysis of the impact of policy changes on the studied systems.

The project is supported by a network of partnerships already established with research teams in both the North and South, and is aimed at developing new sector-based and marketing policies to foster sustainable development of livestock production areas. It is also supported by the transversal Animal Production Economics and Policy research group (CIRAD) to broaden the research area and shift the discussion to an international level.

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information systems, spatial analysis, geography, environmental sciences and territorial development. The ultimate aim of this research unit is to manage spatial information in order to boost knowledge and management of environments and territories.

Spatial information is managed using an approach that integrates the entire chain: spatial data acquisition techniques, data processing, spatial and temporal analysis, translation of this data into relevant information for subsequent transfer to stakeholders, methods for analysing organizational, sociological and political processes associated with information sharing.

UMR TETIS investigates issues of interactions between information

production, training and support of stakeholders, provides support for project development and implementation, while favouring the apprenticeship process which contributes to enlightening, streamlining and 'rationalizing' stakeholders' viewpoints.

There are three main lines of research:

- Analysis of spatial structures and spatiotemporal dynamics
- Remote sensing, spatial data acquisition and processing
- Information system design
- Territorial information and development.

A fifth line is devoted to training (20% of the unit's activities): primary training of engineers, Master's courses,

PhD training, continuing professional training, etc.

Several research programmes concern societies and sustainable development:

- *Territoire de Thau* project (Syndicat mixte du Bassin de Thau, France)
- European projects: Periurban landuse relationships—Strategies and sustainability impact assessment tools for urban-rural linkages, Landuse policies and sustainable development in developing countries, Synchronising information for local-national participatory natural resources management (SINREM; Guatemala, Honduras, San Salvador) and Dialogos Brazil (Amazon)
- *Conception d'observatoires de pratiques territorialisées* project (COPT) ●●●



Herding areas are closely linked with markets via the transborder livestock trade.

Economic globalization thus affects even the most marginalized regions. Here a rangeland in the Diéri region, northern Senegal.

- *Excellence et innovation rurales* project: Web tool for data management and guidelines for the analysis of projects oriented towards sustainable territorial development
- *Formation à l'entreprise rurale pluriactive* project (Région Languedoc-Roussillon funding)

Innovative methods for spatialization of information on tropical environments

Spatialization of information on the environment for development purposes is an ideal way to streamline operational applications of spatial observations, to reutilize existing knowledge in the form of maps or expertise, to gain access to new information and enhance interdisciplinary discussions and decision-support processes.

The aim of the service unit (US) Expertise et spatialisation des connaissances en environnement (ESPACE, IRD) is to develop and

implement innovative methods for the spatialization of information on tropical environments through remote sensing and an integrated approach, from data acquisition to the decision-making process. Its activities are programmed within the scope of three methodological research orientations and transversal thematic projects. The challenge of implementing satellite-assisted regional environment monitoring observatory networks underlies this dual approach.

There are three research teams in the unit, focusing on:

- Earth monitoring by satellite: for monitoring the environment in intertropical areas, including indicators spatialized by remote sensing, and near real-time methods for environment monitoring and surveillance
- Integrated approaches to environments and societies: methods for monitoring landscape dynamics for the purposes of setting up environment observatories; spatialization of environment and health risk data
- Integrated information systems for decision making: sharing of mixed data by using new standards of the Open Geospatial Consortium, modelling and databases disseminated for decision support.

The service activities are on two levels:

- dissemination of data and spatialized products posted for online public access
- scientific hosting and access to data analysis and processing techniques.

In partnership with the French *Centre National d'Études Spatiales* (CNES), the unit manages the *Surveillance de l'Environnement Assistée par Satellites* network (SEASnet), which includes four receiving stations that capture high-resolution, wide-angle satellite images of the environment. It calculates and disseminates thematic spatial products (e.g. on the vegetation status) on monitored regions on a daily basis.

These priority application themes include sustainable management of ecosystems in developing counties, continental and coastal waters, health security, health and health care access policies, development and globalization.

The unit manages permanent installations in France, in French overseas departments and regions (DOM-ROM) and communities (COM), as well as work sites (Brazil, Africa, South Pacific/New Caledonia). These sites are linked through an interconnected high-speed network. ■



Agroforestry systems on the Monte Cristo slopes (Guatemala)

J. Imbernon © CIRAD

SINREM: Training and information systems for participatory natural resource management

The European SINREM project (2006-2009) addresses a major bottleneck of participatory natural resource management—the circulation of information across decision levels. The project aims to enhance the application of sustainable natural resource management strategies and contribute to territorial development in cross-border zones of Central America. The project is carried in close collaboration with universities in three Central American countries (El Salvador, Honduras and Guatemala).

It contributes to boosting their capacities and networking with European research centres. It also provides support for two regional organizations, i.e. Trifinio and the *Comisión Centroamericana de Ambiente y Desarrollo* (CCAD), which disseminate the project results throughout the region.

A training process is being developed through the project, while taking the different expectations, outlooks and needs of public and private stakeholders at different decision levels into account—from the local to the national/regional scale. It strengthens local stakeholders' capacities and governance and articulates natural resource management analyses conducted at this level with current development policies. The project focuses especially on:

- stakeholder training and networking
- management of a knowledge base by synchronizing existing information systems
- consolidation of spaces for discussion and negotiation
- development of a cooperative plan for the sustainable development of cross-border zones.

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M. Figué © CIRAD



N. Brice © CIRAD



© R. Mahjoubi



J. Avelino © CIRAD

1. Supermarket in Vietnam;
2. A meal in a Hanoi household;
3. Pepper seller in a Tunisian market;
4. Orosi and Dota coffees, Costa Rica

Subsectors, standards, markets and stakeholder strategies

Globalization, technological change, especially in the fields of information and communications, environmental awareness, climate change, biodiversity and social disparities, and increased health concerns are the focus of many initiatives of agrifood system stakeholders. Sustainable development—beyond being a slogan—is concretely reflected by changes in individual behaviours in companies, households, public and private collectives: company responsibilities, environmental and social standards and regulations, new ‘alternative’ commodity channels, etc. In what forms are these initiatives? What are their impacts on the issues they are targeting? How do they affect the performance of the agrifood sector in developed and developing countries? Expertise in various social science fields and multiscale analyses are needed to address these questions.

How are **market and consumer behaviours** changing? Citizens’ expectations and roles must be identified before being able to gain insight into how sustainable development projects are implemented. This means determining how these people, through their consumption patterns and beyond their representations and individual behaviours, contribute to ensuring that food habits are more sustainable from environmental, health and social equity standpoints. Processes of product qualification, confidence building based on quality labels, and consumer participation in establishing public and private standards are analysed. The focus is especially on products with a territorial origin label, specific modes of production (organic agriculture, small-scale farmer origins) and trade (fair trade), while also taking health concerns into account (sanitary and nutritional quality). In addition, the effects of public policies or changes in the agrifood sector on inhabitants’ food security, especially in poor African and Asian countries, are analysed.

On another analytical scale, the **subsector or commodity-channel concept**, which was first applied in the agrifood domain, has progressed substantially, particularly in Montpellier (France). Several recent events, such as the mad cow crisis, have underlined the importance and necessity of refocusing the research projects and conceptual frameworks applied. Standard approaches should thus be supplemented with analyses of social and environmental performances, which means that new performance indicators must be developed. Global value chains such as institutional economics offer a new angle for subsector analysis. Due to heavy security requirements, product traceability problems are analysed on a subsector scale requiring new organizational arrangements and tailored information systems.

Finally, apart from consumers, agrifood systems are organized around many different stakeholder categories: farms, cooperatives and farmers’ organizations, micro-enterprises and SME, large multinational companies, services, agrosupplies, etc. Their separate behaviours and strategies should be analysed, since each category has its own specificities and interactions with different areas. Sustainable development is a catalyst for new forms of governance involving public and private authorities, where participation, transparency and responsibility are critical factors, and nonhierarchical collaborations are established (markets, networks, etc.). The analysis should be focused particularly on collective organizations, farmers’ unions, the industrial sector, stakeholders investing in the same area and multinational associations. Their management systems, relationships with public authorities and their performances are closely assessed so as to develop tailored decision support tools.

**Leïla Temri (ERFI)
& Nicolas Bricas (UMR MOISA)**

Subsectors, standards, markets *and stakeholder strategies*

Analysis of interactions between operators, institutions and the rural environment in agricultural and agrifood sectors

graduate-level students through research.

In this operational framework, the UMR focuses on:

- standards as agrifood system governance tools
- alternative food supply and demand models
- forms of organization of rural farmers at different levels, and agricultural and rural sector regulation arrangements.

The research is conducted within the scope of a programme dealing with the general question “What governance strategies are best for sustainable development of agrifood systems?” Five research teams are involved, under the following topics:

- Sustainable food consumption
- Strategies, governance and performance of companies and subsectors

- Institutional economics applied to subsectors
- Governance of resources and territories
- Sociology and political economy of sustainable development.

The UMR is participating in a Master's research programme on “Economy and management of agricultural, agrifood and rural development” (UM1/Montpellier SupAgro). This unit was founded in 2001 and its mandate was extended under the 2003-2006 and 2007-2010 quadrennial research contracts. ...

Main teams

UMR MOISA
**Markets, Organizations, Institutions
and Operators' Strategies**
(Montpellier SupAgro, CIHEAM/IAM.M,
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EA 4189 CR2M
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EA 731 CREGOR
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des organisations**
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EA ERFI
**Équipe de recherche
sur la firme et l'industrie**
(UM1)
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...continued page 20

The joint research unit (UMR) Organizations, Institutions and Operators' Strategies (MOISA, Montpellier SupAgro, CIHEAM/IAM.M, CIRAD, INRA, IRD) pools several social science disciplines (economy, management, sociology, socioanthropology, political science). It implements an interdisciplinary approach to assess unstable complex subjects in different geographical and development settings in France and elsewhere in Europe, as well as in Mediterranean and tropical countries.

The research unit also benefits from a large international cooperation network. Its research programme is focused on the analysis of relationships between stakeholders and institutions in agricultural and agrifood sectors and the rural environment, especially forms of coordination between public or private economic agents in a sustainable development setting. The scope of the UMR's research programme is threefold: to gain insight into the issues, to provide public and private stakeholders with decision support, and to train

Local agrifood systems



Wholesale cheese market at Trujillo, Peru

Agrifood activities, through their attachment with the land and emotional aspects of food consumption, enhance tight links between products and territory and promote local development. Since 2000, CIRAD has teamed up with the *Université de Versailles Saint-Quentin-en-Yvelines*, UMI, INRA, the *Institut des régions chaudes* and Agropolis International to form a scientific interest group on local agrifood systems (SYAL). The group's activities involve identifying territorial agrifood organizations, understanding how they function, assessing their performances, foreseeing conditions for their development and studying generalization of the knowledge produced.

A diverse range of products are produced by local agrifood systems, including those with a long or recent history that are designated for domestic markets or export. However, all of these products make effective use of specific resources and participate in territorial dynamics. The SYAL approach involves monitoring their systemization and supervising innovation processes to promote this territorial production expertise. Some of the products studied are: cassava gari and noncommercial palm oil in Benin, shea butter in Burkina Faso, coalho cheese in Brazil and in the Cajamarca region of Peru, brown cane sugar (panela) and sour cassava starch in Colombia.

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Auditing, reporting and piloting sustainable development performances in enterprises

The *Finance, Comptabilité, Contrôle, Stratégie* group (FCCS) of the *Équipe de recherche sur la firme et l'industrie* (ERFI) has developed a line of research on auditing, reporting and piloting sustainable development. Studies have been carried out on the environmental and social reporting topic. Based on a study of sustainable development reports presented by companies, the research focused on the quality of information voluntarily provided by these companies. The adoption of Global Reporting Initiative (GRI) precepts in CAC 40 enterprise reporting was first assessed. This assessment was then broadened to the study of annual reports of SBF 120 enterprises. The reports were then submitted to an assessment grid. These studies, based on a neoinstitutionalist conceptual framework, suggested the involvement of an 'accounting ceremonial'.

Further research has dealt especially with performance management. Studies on the Sustainability Balanced Scorecard concept focus on the inclusion of sustainable development indicators in strategic trend charts. As a follow-up to this research, and in collaboration with the *Académie des Sciences et Techniques Comptables et Financières* its *Club Développement Durable*, a project is under way on designing sustainable development guidelines for micro-enterprises and small and medium-sized firms (SME).

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DR

Market observatory for fruit and vegetables



Market in Brazil

This market observatory is a decision support tool. It is operated by CIRAD and provides support for programming development-oriented research initiatives. It is at the service of public authorities, international institutions and commercial operators in developing and developed countries.

The analyses are based on an information watch—data organized in an efficient information system—and on permanent coordination of a network of professional and institutional contacts in developed and developing countries.

This economic intelligence unit disseminates information and studies through many specialized media tailored to different audiences: monthly journals or newsletters (*FruiTrop*, *Info Banane*, *BanaNews*, etc.), five weekly market updates (banana, orange, small citrus fruits, pomelos, avocados) and a statistical yearbook. Part of its activity is devoted to advising companies and public authorities on policy making.

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Other teams focused on this topic

UMR INNOVATION

Innovation and Development in the Agriculture and the Agrifoods Sector

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UPR 36

Forest Resources and Public Policies
(CIRAD)

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UPR 22 AGIRS

Animal and Integrated Risk Management
(CIRAD)

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UPR ARENA

Collective Action, Policies and Markets
(CIRAD)

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CERTAP Centre d'étude et de recherche sur les transformations de l'action publique
(UPVD)

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Study of the interface between organizations and markets

The *Centre de Recherche sur le Management et les Marchés* (CR2M, EA 4189, UM2/UM1) is specialised in market management in the marketing and finance fields. Markets are the key focus, as illustrated by the different research topics being investigated, such as:

- tapping the full potential of goods, services and enterprises
- assessing the impact of information transfers and the communications role
- developing new technologies and innovation processes
- analysing interactions between market operators
- comparing aggregate data with individual decisions.

CR2M annually organizes thematic days on topics such as 'Agrifood marketing' and 'Sales force management'. It has also signed over 10 agreements with regional and national partners (axis 4 of the Q@LI-MEDiterrannée pole, National food and human nutrition programme, etc.).

CR2M is involved in MONTPELLIER MANAGEMENT E.R. (training and

research), which is a cooperation structure that was founded to showcase—in Europe and worldwide—management science research and training activities at the Montpellier site (France), in collaboration with three partners: UM1 (*Institut des Sciences de l'Entreprise et du Management, Équipe de Recherche sur la Firme et l'Industrie*), UM2 (*Institut d'Administration des Entreprises*, laboratories CREGOR and CR2M) the *Groupe SupDeCo Montpellier (École Supérieure de Commerce, Centre d'Études et de Recherche sur les Organisations et le Management)*.

Three topics are mainly covered within the scope of MONTPELLIER MANAGEMENT E.R. for all the associated laboratories:

- technology management and organization dynamics (information, communication, employment, auditing, etc.)
 - management in the agrifood sector (competition, strategies, traceability, etc.)
 - entrepreneurship and market dynamics (decision making, start-ups, marketing, finance, etc.).
- CR2M is also focusing on another unique line of research concerning stakeholder information and behaviour.



Supermarket in Vietnam

M. Figuié © CIRAD

Organization management– information systems, human resources and strategic control

The *Centre de recherche sur la gestion des organisations* (EA 731 CREGOR, UM2) is specialised in organization management in the fields of information systems, human resources and strategic control. The laboratory pools 32 permanent teacher researchers and 16 PhD candidates. It is structured in three groups, corresponding to three scientific associations, i.e. 'Information systems', 'Human relations', and 'Strategic control'.

Organization is the main research focus:

- System control issues from strategic (watch, planning, externalisation, etc.), organizational (appropriation, animation, assessment, performance, etc.) and technological (architectures, networks, piloting, etc.) perspectives
- Employment and social relation issues (based on flexibility and service relation paradigms).

Over 10 research agreements have been signed by CREGOR with regional partners (*Conseil Général, Chambre Régionale de Métiers, Direction Régionale du Travail*, etc.), national partners (SNCF, *Caisse Nationale des Allocations Familiales, Centre d'Étude de l'Emploi*, etc.) and international partners (Action InterReg AGRO-INTEC in the agrifood sector, European PIC EQUAL project on women collaborators, 'Traceability' project termed Q@LI-MEDiterrannée, etc.). CREGOR also participates in MONTPELLIER MANAGEMENT E.R. (cf. above description).

Organization, enterprise strategies and finance-accounting-control

The *Équipe de Recherche sur la Firme et l'Industrie* (ERFI, EA 714, UM1) initially focused on SME and entrepreneurship, but now conducts research on enterprise organization and strategies, small enterprise strategies and finance-accounting-control. It is structured around three lines of research:

- The *Stratégies des Entreprises de Petite Taille* group (SEPT) carries out research on the management of small- and micro-enterprises under three topics: entrepreneurship, interactions between territories, environments and small companies, strategic micro-enterprise/SME behaviours, and building of specific analysis and decision support tools. ERFI/SEPT coordinates the *Club des Artisans Dirigeants du Languedoc-Roussillon* (*Réseau Artisanat-Université* contract with the *Institut Supérieur des Métiers*). Through an 'acted research' approach, the aim is to develop decision support tools and strategic plans for micro-enterprises. It participates in the *Systèmes agro-alimentaires localisés* (SYAL) scientific interest group.

- The *Organisation et stratégie des entreprises* group (OSE) conducts research on two key themes. This includes research on competitive and cooperative strategies so as to: (i) gain insight into economic phenomena such as labels, R&D consortiums, etc., that occur in contemporary industries, and (ii) to analyse competitive confrontation behaviours (e.g. reconciliation behaviours) especially through in-depth case studies. Studies are also focused on globalization strategies

and strategic environmental management. The *AlterManagement Mondialisation et Écologie* team (AME, cf. 'Environment and natural resource management' chapter) utilizes management science analytical frameworks and tools in its research geared towards enhancing the social and environmental objectives of organizations.

- The *Finance, Comptabilité, Contrôle, Stratégie* group (FCCS) conducts research in the fields of accounting, management control and auditing. It is oriented within the framework of the 'Social accounting, governance and responsibilities' research programme, which is subdivided into three topics: auditing, reporting and governance; sustainable development auditing, reporting and piloting; and public service auditing, reporting and piloting. The research is focused on the subject of environmental and social reporting and performance management through the Sustainability Balanced Scorecard concept and through the inclusion of sustainable development indicators in strategic trend charts.

ERFI is involved in MONTPELLIER MANAGEMENT E.R. (cf. above description). ■



P. Aragon © IAMM

▲ A market seller in action
► Awaiting buyers



P. Aragon © IAMM

Impact of international trade liberalization on fruit and vegetable commodity channels in Mediterranean countries

The aim of this project was to study the potential effects of agricultural free trade between the European Union (EU) and partner countries in the southern and eastern Mediterranean Basin on the 'fruit and vegetable' and 'olive oil' commodity channels of EU Member Countries prior to the enlargement of the Union. The studies were carried out by nine European and Mediterranean research teams (including UMR MOISA).

Trade liberalization was the kingpin of the Barcelona Process (1995), which was geared towards creating a Euro-Mediterranean free-trade zone in 2010. The effects of this Process now do not seem to have met the expectations and needs of southern and eastern Mediterranean countries (SEM). One of the reasons is that over the last 10 years the agricultural sector has been excluded from the liberalization process for fear of potential negative impacts on agriculture in Mediterranean EU countries.

This research sought to determine if these fears were well founded. Five points sum up the answers to this question:

- Trade of agricultural and food products between countries located on different Mediterranean shores is minimal and asymmetrical: for SEM, EU is the main partner for SEM, especially for exports, whereas trade with SEM represents a very minor share of the EU trade volume; there is very little intra-SEM trade.
- There are substantial complex and dissuasive protective

instruments at EU borders for fruits and vegetables. They differ according to the product, country and season and have many complex and relatively nontransparent impacts. The parameters are negotiated with Mediterranean countries within the scope of bilateral trade negotiations, outlining trade preferences between Mediterranean countries for EU market access.

■ There is little potential for growth in Mediterranean exports of these products to the EU market in a partial or total free trade environment. The fears noted above are thus unfounded.

■ However, there is substantial potential for growth in EU exports of agricultural products to SEM. The social impact of this free trade in some SEM could thus be more serious than within the EU.

■ For EU farmers, free trade with SEM would have a limited overall impact. However, it could be very damaging for some products and regions. Calculated regional vulnerability indices suggest that there are major regional disparities in the EU. The European losers would be concentrated in a few regions, and within these regions there is a variable number of farmers and companies that process and ship very specific products. This concentration should facilitate identification of the losers and the implementation of potential compensatory measures by public authorities.

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Forquilha Valley in Ceara state, Brazil

J.-Y. Jamin © CIRAD

Environment and natural resource management

On a global scale, pressure on natural renewable resources and environmental damage are reaching critical levels, suggesting that economic development based on current types of consumption and development patterned on the Western model is not sustainable. Emerging countries (Brazil, India, China) are making their entrance on the economic scene, while OECD (Organisation for Economic Co-operation and Development) countries are continuing to implement a growth model that is not conducive to sustainability (and alternatives are still in the preliminary development stage). This is triggering market tensions, promoting heavy natural resource use and causing major environmental damage, with global warming being the most symbolic evidence of this trend.

Research teams focus especially on issues arising with respect to long-term management of renewable resources and the environment. Studies are also now being conducted on the socioeconomic and environmental impacts of renewable resource management and of mining resource development.

It is essential to deal with issues concerning the complexity and diversity of interactions between societies, their resources and environment in order to be able to manage natural resources and the environment in a sustainable development framework. The scientific accent should be jointly placed on gaining

insight into resource allocation strategies and decision-making processes so as to determine the dynamics involved on the basis of socioeconomic, environmental and political factors.

The diverse range of research and expertise situations covered by the concerned teams enables the development, under specific conditions, of international comparisons of global studies and assessments, thus enhancing the overall understanding of interactions on local to global levels. Research teams are fully prepared to contribute to international discussions on sustainable management of renewable natural resources in appropriation conditions ranging from private property, global public goods and common property resources.

Here a broad range of renewable resources are assessed, especially water, biodiversity, forest and pasture resources. A specific case concerning livestock production systems, especially pastoral systems in dry areas, is also covered as it illustrates challenges associated with controlling sanitary risks and emerging diseases. Due to current issues associated with the development of competitive uses or renewable resource appropriation, negotiation tools and role-playing games are required for the analysis, in addition to comprehensive approaches to gain insight into social changes and stakeholder strategies.

Pierre-Marie Bosc (UMR MOISA)

Environment and natural resource management

Social sciences, agronomy and ecology for studying 'society-nature' relationships

Research conducted by the *Dynamiques socio-environnementales et gouvernance des ressources* unit (IRD) is primarily focused in the fields of environment and natural resources. An approach that combines social sciences, agronomy and ecology is implemented to study subjects that are shared with other biological, biotechnical and biophysical science disciplines, including biodiversity, forestry, water and soils.

Based on socioenvironmental innovation and resource access governance concepts, the main scope of this unit's investigations encompasses society-nature relationships and relationships between members of these societies in their interactions with nature. It analyses relationships between local practices and public policies in the management of biodiversity and protected areas, agrarian transitions, water and irrigation and land resources in the current setting of public disinvestment, decentralization and promotion of local know-how.

The socioenvironmental innovations involved include systems that are set up both locally and globally to address environmental concerns. These innovations are developed—at the interface between biotechnology, political, institutional, geographical, economic and social fields—to deal with major issues, including resource

access and use, the distribution of benefits generated by this use, as well as the management of its unforeseen or unwanted impacts. The underlying assumption adopted here is that these environmental issues extend beyond the limited scope of nature conservation within which they were long associated; they are part and parcel of the fight against poverty and inequality, and of critical assessments of global development strategies; and environmental imperatives are crucial in this setting. These issues are also linked with public policy tools, private strategies and local governance systems.

The unit consists of researchers in the fields of socioanthropology, ethnoscience, geography, natural resource economics, agronomy and ecology. The research is carried out in Africa, Southeast Asia and South America.

Supporting collective resource management processes

The overall aim of the Management of Renewable Resources and Management research unit (GREEN, CIRAD) is to generate knowledge, methods and tools that can be used to: (i) understand interactions between natural resource uses and ecosystem viability, and (ii) to support collective management processes.

Conditions of interactions and arbitration between ecosystem preservation and development are crucial to sustainable environment management. The issues are

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UR 199
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UR 47 GREEN
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UMR G-EAU
**Water Resource Management,
Actors and Uses**
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Costs and benefits of groundwater protection



Drilling into a groundwater aquifer

The 2007 European Union Groundwater Directive states that groundwater in Member Countries, which is often heavily contaminated by agricultural and industrial pollutants, must be restored to a good chemical status. Within the framework of the EU Background Criteria for the Identification of Groundwater thresholds programme (BRIDGE), BRGM evaluated the cost of implementing realistic measures to meet this depollution objective in Alsace region (France). In the analysis, the hypothesis of total depollution

(elimination of all traces of pollutants) was tested, in addition to a less ambitious hypothesis of depollution to a stage at which the water would qualify as drinkable (containing trace pollutants, but safe for humans). The total cost of achieving these two levels of depollution was respectively 22 and 52 million euros, i.e. €13 and €30 per inhabitant.

This cost estimate was then compared with inhabitants' willingness to pay for this environmental enhancement through a survey of 668 households in 2006. It was estimated that inhabitants were willing to pay €42/year over a 10 year period for the first hypothesis and €76/year for the second. The net profit calculated for the two hypotheses revealed that the less ambitious scenario was economically acceptable, whereas eliminating all traces of pollutants would be extremely expensive compared to the benefits generated for inhabitants.

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significant in developing countries since the inhabitants are highly dependent on renewable resources, and also in both the South and the North because of the shift in decision-making centres as a result of globalization and decentralization. These issues have attracted the interest of research to gain insight into complex social and ecological processes and to share this knowledge, to ensure the viability of these processes, support management processes that integrate the environmental and long-term dimension, and assess the information asymmetry and concerned stakeholders' participation.

The unit conducts research on the development and implementation of renewable resource and environment management systems, standards and rules, and on the discussion of local to national management practices. There are four main lines of research (which are currently being reformulated), involving different disciplines (agronomy, modelling, informatics, ecology, geography, economy, sociology, legal anthropology):

■ *Analysis of individual and collective decision making on access to and use of these resources.* Shared representations of interactions between concerned stakeholders and their environments must be constructed for these collective decision-making processes. These representations are analysed and integrated in terms of the environmental, institutional and socioeconomic setting and its patterns in order to enhance the understanding of processes of management system development selection and appropriation by stakeholders.

■ *Production of representation tools (role playing, mapping) and simulation models that facilitate the building of shared representations,* which are developed and used in collaboration with stakeholders, while integrating biophysical, social and economic aspects.

■ *Assessment of the so-called 'support modelling' approach for collective learning and implementation of sustainable management systems.*

■ *Questioning choices of analytical scales and the integration of organization and decision-making levels in scientific analysis.* This applies to research aimed at: (i) supporting stakeholders in determining and appropriating management systems or practices, and (ii) conducting *ex post* assessments on the impact of these systems on ecological and social processes.

Applications* are developed within the research unit and through network collaborations with other Agropolis International teams and partner universities in developing countries. The application areas are land use in Sahelian Africa and in Réunion, biodiversity in Brazil and Madagascar, agrobiodiversity in West Africa and Latin America, and watershed management in Asia. ...

* For further information: open modelling platforms developed by GREEN: <http://cormas.cirad.fr> & <http://sourceforge.net/projects/mimosa>; support modelling network site: www.commod.org



▲ *Periurban agriculture in the São Paulo region, Brazil*

► *Drinking water tank in Cochabamba, Bolivia (left)*

► *Watering a vegetable garden, Bolivia (right)*



R. Ducrot © CIRAD



R. Ducrot © CIRAD

Main teams

URP 68 Pastoralism

(CIRAD, ISRA, ENEA, UCAD, CSE)

17 scientists, 6 PhD candidates

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UPR 22 AGIRS

Animal and Integrated Risk Management
(CIRAD)

27 scientists, 8 PhD candidates

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et Écologie

(UMI, AgroParisTech/ENGREF)

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... continued on page 30

Overcoming water conflicts in periurban areas of Latin America

The Negotiating Periurban Water Conflicts project (NEGOWAT) was aimed at curbing tensions between interest groups and promoting negotiation to improve water management in Brazil and Bolivia by including civil society in collective decision-making processes. The advantages and shortcomings of simulation tools (role playing) were tested to strengthen participants' skills and find consensus solutions in different interventions. In Bolivia, the project: (i) set up a platform for discussion on a highly criticized water and sanitation project, (ii) developed a multistep method to help drinking water community associations with their technical, administrative and financial management, and (iii) minimised the impact of urbanization on irrigation networks in two communities. In Brazil, the goal of the first intervention was to boost the negotiating capacities of community officers on sanitation issues through a support modelling procedure tailored for periurban regions. The second intervention was aimed at increasing the awareness of members of a catchment basin committee on water quality management and initiating discussions on the role and status of agriculture in this type of catchment.

In addition to insight gained on the water management systems of these regions, the studies involved an analysis of the shortcomings and advantages of multistakeholder platforms for natural resource management, as well as discussions on the use of simulation tools and natural resource governance at several levels. A follow-up and assessment of these interventions revealed that the community representatives had strengthened their capacities for interaction and negotiation with other organizations, and that the awareness of institutional stakeholders had been enhanced on some aspects of water management that had not initially been taken into account. Finally, the results and their dissemination were limited by organizational and institutional shortcomings typical of periurban areas.

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Water governance and institutional framework changes in South Africa

Research conducted in South Africa by CIRAD (UMR G-EAU, UPR GREEN), in collaboration with the Centre for Environmental Economics and Policy in Africa (CEEPA) and the University of Pretoria, is aimed at supporting new water governance organizations (Catchment Management Agencies, CMAs, Water User Associations, WUAs) by proposing socioeconomic strategies, tools and methods to support them with sustainable water resource management negotiations and collective decision making. Since 2002, four projects have been carried out in collaboration with local universities, the Water Research Commission, the South African Ministry of Water Affairs and Forests and the Department of Science and Technology amongst other partners.

The Action-Research on Institutions, Social aspects and Economics of water management project (ARISE), as part of the South African-French Network for Research in Water Science and Technology, was launched for a 4-year period in 2007. The aim is to generate knowledge and develop methods to help solve water resource governance issues in rural areas. The goal is also to strengthen ties between research teams from both countries through cosupervision of graduate students, thus promoting the development of expertise in the water management field. A PhD candidate and two South African MSc students, as well as two French PhD candidates, are currently being cosupervised within the framework of this project by research teams from France, South Africa, Italy and USA.

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A woman allocating collected water for different uses, Ga-Gekororo, South Africa

© S. Farolfi

Technical, economic and social management of water and associated ecosystems

The joint research unit (UMR) Water Resource Management, Actors and Uses (G-EAU, AgroParisTech/ENGREF, CEMAGREF, CIHEAM/IAM.M, CIRAD, IRD, Montpellier SupAgro) proposes to provide practical knowledge on issues concerning the management of water and associated ecosystems, on reference situations in developed and developing countries, thus helping to identify levers to overcome these constraints. The UMR deals with many different research topics:

- water resources (variability, sustainability, allocation, transfers)
- management institutions
- water services and uses

■ behaviours and viewpoints of users and stakeholders involved in water management

■ production systems and irrigated crops, environmental impacts of irrigation practices.

There are three lines of research, with human and social sciences focused in lines 2 and 3:

1. *From operational management to the analysis of resource allocation scenarios.* The research is aimed at managing water flows, on different time scales, in systems that combine water tables, canals, rivers or dams.

2. *Consultations on water, public policies and service management.* This research deals with the assessment of public water policies in conjunction with other policies, institutions, types of usage regulation, and economic or informational tools for water

service management. The issues assessed concern resource sharing and access to water and sanitation services, aquatic environment quality, and vulnerability to water-related risks (drought, flooding). One specific feature of this UMR is that it promotes the use of models (computerized or not) with stakeholder participation.

3. *Water practices and uses.* The topics investigated include users' behaviour (agricultural water) and determining factors, the performance of agricultural production systems and irrigation equipment, including their effects on the environment, and the development of innovations for these agricultural systems.

Two transversal missions devoted to education and training and to decision-support tools supplement the unit's research. ...

► *Irrigated area at Muden, South Africa*



P.-Y. Le Gall © CIRAD

Other teams focused on this topic

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UMR TETIS
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Socioeconomic features of water resource management policies

How can economic development, landuse planning, groundwater management and protection planning policies be consistent? How can the socioeconomic impacts of alternative water management projects or policies be assessed, while taking rapid changes in the economic, regulatory and climatic environment into consideration? How can the general public get involved in water policy development on a local scale in order to gain further insight into the nature of economic concerns associated with water?

The *Économie de l'eau* group of the **EAU-RMD** team (BRGM) is addressing these public decision makers' concerns by developing multidisciplinary tools and methods, and implementing economic, sociological and prospective analysis conceptual frameworks. The aim is to come up with operational solutions for implementation of the EU Water Framework Directive, with research carried out in different areas (France, Europe, Middle East).

Since 2003, the research has been conducted along four lines:

■ Economic assessment of water resource protection measures—according to the WFD, Member

Countries are obliged to evaluate the cost of measures required to restore water bodies to a good chemical status by 2015. Operational methods involving economic engineering tools and environmental economics methods are developed and tested.

■ Economic impact assessment and tools for monitoring diffuse groundwater pollution from agricultural origins—the team develops and tests methods for assessing the cost of this pollution. Agricultural economics models are developed to simulate the impact of regulatory, contractual or incentive instruments on water supply strategies according to agricultural production and nitrogen pollution risks.

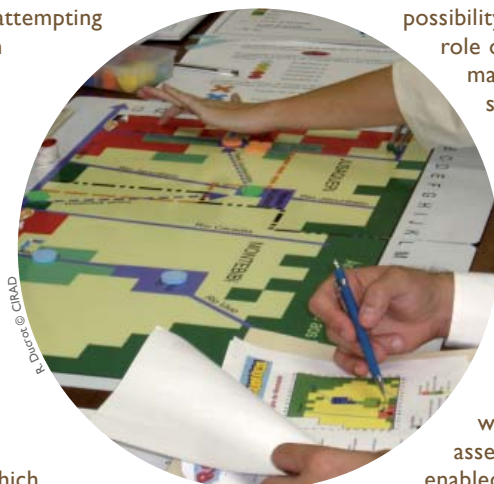
■ Prospective analysis and development of economic scenarios on a catchment scale—methods for drawing up different scenarios, with stakeholder participation, are developed and tested in different catchment basins in Europe (Hérault, Roussillon, Meuse, Rhine). The scenarios are designed to reflect potential patterns with respect to economic activities in an area and the water resource status.

■ Public participation—within the framework of several European and French national research projects, the team, in collaboration with the UMR G-EAU, tests and compares several public participation methods that could potentially be implemented in application of the WFD.

Analysis of concerted water management processes and games as support tools

Many complications may arise when attempting joint or participatory implementation of management policies because of the range of different stakeholders' viewpoints and ways of handling situations. Research is being conducted to analyse these problems and develop new consultation support tools such as *Concert'eau*, which was developed following an analysis of tensions in the quantitative management of water in a small catchment in the Pyrénées-Orientales region (France).

Prior to setting up a concerted implementation initiative, this tool, which involves a game and a debriefing scheme, enables future participants to gain insight into the wide range of viewpoints and potential tensions that could arise. It also provides an occasion to discuss the existing water management consultation system relative to the deliberative situation proposed in the game. *Concert'eau*, offers players the



possibility of simulating consultations by playing the role of people who must defend a good water management plan rather than personal or sectorial interests. There are four teams called Do, Re, Mi and Fa. The 'Do' team must therefore promote water for its heritage value. For the 'Re' team, water is a resource that must be economically and technically optimized. For the 'Mi' team, water belongs to everyone and its management is a public concern. Environmental preservation is crucial to the 'Fa' team. A debriefing phase enables players to stand back and assess a real water management case based on collective assessment data. *Concert'eau*, has, for instance, enabled stakeholders to discuss water use hierarchies during shortage periods.

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▲ '*Agualoca*' role-playing game as a water resource management support tool in a catchment basin of Brazil

Implementation of policies and practices for the sustainable management of trees and forests

The internal research unit (UPR) Forest Resources and Public Policies (CIRAD) is seeking the best tradeoff between forested or wooded area uses and sustainability. This involves supporting the implementation of tree and forest management policies and practices, while also striving to accommodate local inhabitants' interests, development and environmental preservation. This is done by generating fresh knowledge, developing methods for sustainable, concerted and local management of forest areas and their resources. Stakeholders will have access to the results of this research so as to foster the drawing up and implementation of policies for sustainable and equitable forest and wooded area management systems.

This UPR is highly multidisciplinary, i.e. ecology, geography, forestry, economy, sociology and ethnobotany,

and conducts research in Africa, Asia and North America. There are three main thematic foci, in addition to a fourth transversal focus aimed at developing tools and methods:

1. *Efficiency and appropriation of some public policy instruments*—a topic that spans the entire public policy deployment cycle from their design to the assessment (*ex post*) of their effects or impacts on the forestry sector or on territories and the analysis of how they are accepted.

2. *Decentralisation. Local resource management*. Does the large-scale decentralization and devolution of forest resource management in favour of communities result in an improvement in living conditions and the environment or boost the pressure due to population growth, meeting basic needs and striving to gain immediate profits? Do they de facto lead to steady forest degradation and a loss of local inhabitants' traditional know-how?

3. *Representations, uses and biodiversity—changes in practices, ecological changes*. For viable forest

management, it is essential to consider the biophysical features of forest ecosystems as well as the rights, intentions and know-how of forest users. The human and environmental aspects of various systems and their resilience, adaptation and transformation capacities are analysed in addition to public policies, their appropriation and impact on these systems.

4. *Tools for monitoring forest area management and use of their resources*—Research on the functioning and patterns of forest areas is based on biological and social approaches. This integrated approach represents a challenge and a strategic issue for CIRAD in response to increasing demand from societies in terms of sustainable forest resource use and of the ecosystem approach promoted by international discussions on forests. Methods and tools are developed and tested for monitoring and decision support with respect to forest area management and use of forest resources. ...



Everyone awaits his turn for water access. Ferlo, Senegal, rural municipality of Thieu

B. Toutain © CIRAD

For sustainable development of pastoral systems in dry areas

The *Pôle Pastoral Zones Sèches*, founded in Dakar in 2001, became the Pastoralism cooperative research unit in 2005 (URP 68, CIRAD, ISRA, ENEA, UCAD, CSE). Its main aim is to contribute to the sustainable development of pastoral systems in dry areas. It implements a multidisciplinary approach to analyse interactions between social and biophysical systems and develop natural resource management and decision support tools.

Pastoralism was viewed as a human activity responsible for overgrazing and abusive land use during the last major sub-Saharan droughts. Pastoralism has made a successful comeback as a result of the recognition that it participates in enhancing the environment. Research in the 1990s reconsidered rangeland ecology and established the respective contributions of climatic factors and pastoral activities to environmental degradation. This highlighted the rationality and adaptation capacities of herders, their interdependence with respect to the environment, as well as the intrinsic environmental patterns and trends.

The research is conducted along two lines concerning the dynamics and organization levels of pastoral systems and environments:

- Contributing to the sustainability of pastoral systems by explaining their functioning and dynamics:
 - Are ecosystem dynamics in arid areas compatible with the sustainable maintenance of current pastoral systems?
 - What is the role of pastoral herding in the development of livestock production?
- Improving the functioning of pastoral systems by concentrating on organization and scale levels:
 - How can their functioning and productivity be improved?
 - What social, political, economic and technical tools are needed to support their dynamics?

The social science research challenges of the team are formulated in various research programmes on the basis of a view of pastoralism characterised by adaptation, external exchanges and multiple activities. These are the pillars of the recognized sustainability of pastoral systems and lifestyles. The future of pastoral societies depends more on their capacity to negotiate their socioeconomic relationships with production and exchange and their political representation than on climatic hazards.

Animals central to health and environmental risks associated with global changes

Global changes are now prime concerns for individuals and societies as they bring uncertainty with respect to their food, sanitary and economic security, and to meeting their needs and future projects. The risks and uncertainty associated with these changes are thus priorities on all agendas in both the North and the South (Millennium Goals, Intergovernmental Panel on Climate Change, World Trade Organization, etc.). Wild and domestic animals have a key role in ecological, economic and social processes associated with changes. Animals are factors, revealers and accentuators of change and associated risks, which they embody or to which they are subjected.

Conflicts concerning animals (economic constraints, social demand, sanitary requirements and ecological necessities) are constantly worsening. Risks associated with changes in livestock production systems at risk (highly intensive or extensive), or in ecosystems wildlife and health (emerging diseases, health safety), should be taken into account when developing or implementing strategies and policies of societies ...

LEAD-SIPSA programme:

an information system for pastoralism in the Sahel

In the Sahel, pastoralism is the main activity practiced for the sustainable management and use of fragile and sparse rangeland resources. This activity is, however, now hampered by new constraints:

- reduction in the size of pastoral rangelands as a result of high population growth and increasing competition for access to natural resources, and also due to the development of protected areas
- direct and indirect restriction of movements in rangelands
- modification of the economic function of pastoral systems as a result of the shift in favour of world market production and due to increased competition with other production systems to serve domestic markets
- major climatic changes and recurring drought.

Livestock farmers and political representatives require specific information to be able to cope with this situation and to draw up sustainable development strategies for pastoralism. The second phase of the LEAD-SIPSA programme (MAEE/FAO funding) in Burkina Faso, Chad, Mali, Mauritania, Niger and Senegal is to set up an information system for pastoralism in the Sahel. The programme is divided into four components:

(1) Public awareness and training, (2) Networking and institutional anchoring, (3) Development and implementation of the SIPSA technique, and (4) Monitoring and assessment. The midterm results obtained for these components are as follows:

- setting up and consolidation of a functional dynamic network mobilizing national and international expertise on pastoralism and involved in the programme
- boosting public awareness on the programme issues, aims and deliverables
- drawing up a general charter for sharing information products derived from this programme, currently being amended and validated in each national coordination committee.
- drawing up the general SIPSA specifications, currently being finalised and tailored in each national coordination committee.
- information products used and accounted for in decision support processes concerning livestock production policies
- supervision of around 10 trainees (Master's level, engineering school).

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For further information: www.fao.org/AG/AGAINFO/projects/fr/lead/sipsa/home.html

TRANS Programme:

Livestock farming transformations and rangeland dynamics

The dynamics of change in livestock farming activities are central to the sustainable development of many grassland and pastoral regions. The vitality of these areas depends closely on herbivore farming patterns, which in turn contribute to changes in natural areas and are pivotal to environmental issues. The TRANS project (ANR 2005-2008 funding) aims to implement new ways of assessing livestock farming transformations and correlate these transformations with rangeland dynamics.

This research programme is structured along two main lines. The first involves analysis of changes on the livestock farm level, while the second correlates farming dynamics with ecological and landscape dynamics. The research combines farming season time scales, farm trajectories, agroecological dynamics, and spatial scales ranging from the field to the farming area. There are five main study areas (Amazon, Pampas, French mountains and hills, North Vietnamese mountains and the Sahelian region). These areas pool a diverse range of environments, farming dynamics and public policies that are useful for comparing methods and analysis frameworks and developing generic models and knowledge. French-speaking research teams are involved in conducting studies on livestock farming changes and rangeland dynamics.

The URP (cooperative research unit) 68 team is involved in the research and coordination of both parts of this programme on the topics 'long-term change relationships' and 'support modelling'. Six training Master's level courses, a PhD thesis and a post-doctoral fellowship have been funded and supervised since 2005. The research is focused on assessing the emergence of wage earners, changes associated with



B. Dedieu © INRA & S. Cournut © Enitac

Ranching systems in fallow areas of the Amazon forest region

pastoral resource access, long-term change relationships via family-herd relationships, livestock farming model genericity elements through comparative studies.

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For further information: www2.clermont.inra.fr/TSE/trans.htm

in 'rapidly and unstably' developing countries of the South, especially with respect to the most vulnerable social groups.

The UPR (internal research unit) Animal and Integrated Risk Management (**AGIRS**, CIRAD) focuses on sanitary and environmental risks that threaten societies of developing countries (emerging diseases) or, locally, vulnerable production systems (multispecies systems), and proposes to:

- identify, through observatories and permanent monitoring systems, major risks associated with animals that could be detrimental to the health, development and safety of vulnerable societies of the South, while also endangering those of the North
- describe and quantify key structural and functional factors of the main risks associated with animals and uncertainties due to associated changes (linked with the environment, mobility and the market)
- model major risks linked with animals using decision-support

scenarios at different scales to help to understand, foresee and manage risks

- design and test management and intervention tools to monitor, prevent and limit their causes or consequences
- incorporate the risk perception of different stakeholders in decision-making parameters and management tools.

Sustainable development, natural resource management, designing and testing public policy instruments

The joint research unit (UMR) **LAMETA** (UM1, Montpellier SupAgro, CNRS, INRA) conducts both theoretical and applied research. Its scientific project consists of six research programmes, four of which directly concern sustainable development, natural resource management, and designing and testing public policy instruments. The methods implemented are

focused especially on modelling and formal approaches (game theory, mathematical programming), quantitative methods (econometrics) and laboratory and field model tests. These six research programmes are as follows:

- '*Behavioural and experimental economy*' involves studying and designing efficient incentive mechanisms for solving conflicts and social dilemmas. The adopted method consists of controlled laboratory experiments to monitor subjects' behaviour during strategic interactions.
- '*Economic policies and public choices*' recenters previous macroeconomic, public economics and industrial organization research on public action in externally-oriented economies faced with increased competition, and with increasing economic and social inequalities. Macroeconomic, redistribution and health policies, as well as competition and transportation policies are investigated.
- '*Applied econometrics*' concern the econometrics of commodity markets,

Observatories in support of collective action

Information is a key element in an ever-changing agricultural world. Shared, reliable, up-to-date information is vital in coordinating activities, implementing collective operations and managing rural territories. This information—which may be of high or poor quality, scattered, incomplete or disorganized, depending on the situation—can be compiled, organized and disseminated by setting up an observatory.

The UMR TETIS (CIRAD) developed a new participatory approach to build such observatories in defined territories on the basis of collective actions targeting a specific issue.

Between 2005 and 2007, a test was carried out in two areas of France: the Aume-Couture basin (Charente region), where the central issue was water management, and the Hien valley (Isère region), where the issues were biodiversity and water quality. Rural stakeholder groups were asked to build an observatory and lay the foundations for an information system.

The approach consisted of four stages:

- Expressing needs: determining the priority issues,

identifying and mobilizing stakeholders, understanding their contributions to the issues and explaining their information needs to characterize, understand and follow up the practices

- Representing the viewpoints: modelling the information system, organizing the observatory with its partners, databases and geographical information systems.
- Developing the computer application, setting up the data management procedures
- Deciding, learning and producing knowledge to address the territorial issues, assessing stakeholder appropriation of the observatory, its impact on negotiation and coordination processes, preparing recommendations for improvement or adaptations.

The feasibility study concluded that the approach was relevant, highlighting the extent to which stakeholders were involved and the importance of formalizing how the different stakeholders expressed their aims and viewpoints. There are plans to introduce the method in other situations in both developed and developing countries, and to extend its use.

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■ **'Sustainable development analysis and modelling'** conducts research on sustainability criteria in a setting of natural resource management, new risk assessment approaches and the analysis of the most efficient policy instruments used to guide agents' technical innovation choices.

Research of the *AlterManagement, Mondialisation et Écologie* team—part of the **ERFI** group (*Équipe de recherche sur la firme et l'industrie*, UM1), in association with AgroParisTech/ENGREF (Montpellier centre)—is carried out with analytical frameworks and management science tools that are used to meet organizations' social and environmental targets.


The emphasis is on globalization strategy forms and impacts from the standpoint of management systems, working and employment conditions, territorial relationships and sustainable development prospects. It offers an innovative approach to environmental strategic management, whereby ecological performance is central to the efficiency criteria in the framework of development projects or enterprise social responsibility policies. At the enterprise-society interface in developed and developing

Several commodity chains are studied with respect to social and environmental issues, including agrifood subsectors, through several ongoing theses and recent projects. ■

IMoSEB: *International Mechanism of Scientific Expertise on Biodiversity*



pBes
The Intergovernmental science-policy Platform
on Biodiversity and Ecosystem Services



Since late 2005, at its Baillarguet facilities, CIRAD has been hosting the Executive Secretariat responsible for coordination and promotion of the consultative process towards an International Mechanism of Scientific Expertise on Biodiversity (IMoSEB) that was entrusted to the *Institut Français de la Biodiversité*. For almost 3 years, this small team, supported by the International Steering Committee and its prestigious Executive Committee, has launched case studies on mobilizing expertise in certain fields, widely communicated on the project in different media, and organized multi-stakeholder consultations on all continents. The consultation findings bridged the gap with the follow up to the Millennium Ecosystem Assessment and the United Nations Environment Programme. The initiative should quickly give rise to an IPCC equivalent in the biodiversity field: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

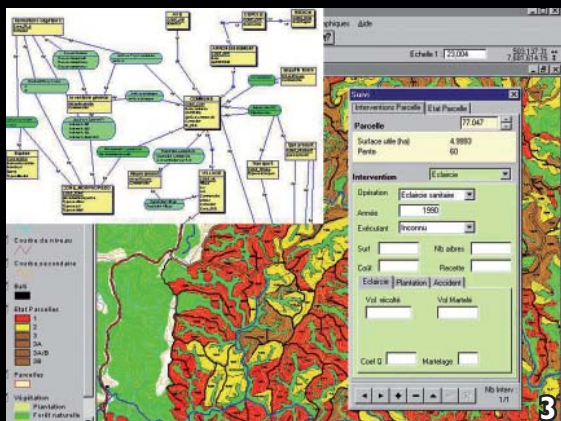
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For further information: www.imoseb.net and www.ipbes.net



E. Bacary Daou © CIRAD



L. Elies © CIRAD



M. Passoyant © CIRAD

1. Rice fields of the Office du Niger, Mali
2. Office du Niger, Mali
3. A geographical information system

Desertification and long-term environmental monitoring in Africa—Long Term Ecological Monitoring Observatories Network



African areas with serious drought constraints are typically inhabited by rural societies in the throes of social and population change. Their fragile and nonresilient ecological systems have been upset by heavy human disturbances and acute drought, leading to land degradation, and ultimately desertification. It has thus become

essential to develop environmental monitoring tools.

ROSELT, a key programme of the Sahara and Sahel Observatory (OSS) since 1994, is the first regional African network of institutions in South-South-North collaborations to share expertise and knowledge on local environmental observatories in 11 circum-Saharan countries. It contributes to the assessment, forecasting and monitoring of environmental changes, while providing a permanent local monitoring unit that supplies data for environmental research programmes and national environmental monitoring systems. It applies streamlined consensual information collection and processing methods. It develops common and spatiotemporally comparable products, including biophysical and socioeconomic indicators, and spatialized land degradation risk indicators.

From 2000 to 2005, ROSELT defined and implemented *ad hoc* methods in scientific collaboration with IRD. An environment information system was designed, developed and applied, based on:

- thematic methodological guides
- a local environment information system (LEIS)
- a web-based information circulation and sharing system (MDweb).

The results confirmed the land degradation and desertification trends. The socioeconomic findings reflected disparities between North and West Africa. On a regional scale, they provided a socioeconomic follow up, thus enhancing the interpretation of ecological observations and consequently of desertification dynamics.

ROSELT now has the capacity to provide reliable and replicated information. The methods are adopted by partner institutions and applied at different levels in various countries. Its status and functioning are currently being redefined through these member institutions for a potential transfer of governance to partner countries. These methods are implemented in national observatory networks. Internationally, the ROSELT experiment is represented in many scientific and institutional bodies, thus enhancing recognition of the added value of local observations and accounting for them in current regional and international initiatives.

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For further information: www.roselt-oss.org
and www.mdweb-project.org



Petroleum platform in Mauritania

G. Magrin © CIRAD

Extractive activities: impacts on renewable resources, governance, economies, societies and territories

Studies have been carried out by CIRAD researchers in recent years on long-term extractive activities and changes in the strategies of companies, governments and civil society, and also on discussion and negotiation conditions, their potential and limitations. The main aims of these studies have been to determine the impacts of extractive activities in New Caledonia (nickel) and Guinea (iron), to develop a regional development plan for the petroleum area in Chad, within the framework of projects supported by the World Bank, and to build a discussion platform on petroleum and gas extraction activities in Mauritania, under the aegis of UICN (*Union Internationale pour la Conservation de la Nature* - World Conservation Union).

A process has been under way since 2007 to tap the benefits of this individual and collective experience, and several thesis studies have been initiated. Two seminars were organized by teams of the CIRAD Environments and Societies department (UMR TETIS, UMR MOISA, UPR ARENA) on the topic of supporting territorial development processes with respect to extractive activities. This provided an opportunity to bring together this informal (so far) community of researchers interested in the issue of the impact of nonrenewable resources (mines, oil, gas) on renewable resources, governance, economies, societies and territories. Various studies were presented at the first meeting (March 2007). The second meeting (September 2007) was open to other institutions (BRGM, *Université de Paris I/Panthéon-Sorbonne*, UICN Seaprise Commission, *Groupe de recherche sur les activités minières en Afrique* (GRAMA) of the *Université du Québec à Montréal*, University of Brasília, and

the *Facultad Latinoamericana de Ciencias Sociales Sede Ecuador* (FLACSO) based at the University of Quito, etc.).

These exchanges revealed the extent to which, in many developing countries and French overseas regions, extractive activities are catalysts of change in nature/stakeholder-societies/areas relationships at different scales or organization levels. The analysis findings also prompted researchers to go further into the comparison of extractive activities and the renewable resource domain (agroindustry, logging, fisheries, etc.). Questions on their socioeconomic, political and environmental impacts take similar forms in the different sectors. Similarly, issues associated with revenue sharing and possibilities of implementing more efficient regulations would warrant further in-depth investigation. The question of research ethics and conduct was specifically investigated, while we intervene in settings marked by major asymmetries between stakeholders, with considerable economic and financial imperatives concerning their activities.

A multistakeholder (researchers, NGOs, companies, public decision makers, students) network, called the Network for Applied Research on Mining, Oil and Gas Activities (NARMA), was founded to promote information exchange and analysis. It is open to all interested people who accept to join the discussion.

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G. Napolitano © FAO

*High level conference on global food security,
3-5 June 2008, Rome*

Public goods, policies *and international regulations*

Agriculture, in all of its forms, represents a major global challenge (food security, poverty alleviation, renewable resource management, fossil fuel depletion, climate change). International competition, liberalization and decentralization policies underpin the development of international flows, prompting reorientation of activities and farms, and thus restructuring of territories and sector-oriented agricultural dynamics.

Tools developed by Agropolis International teams to analyse agricultural and rural dynamics help to account for: (i) the integration of sustainable development dimensions, and (ii) the linkage of decision scales and levels. At least one of the following phenomena now applies to all local situations:

- globalization dynamics, characterized by the development of companies and powerful integrated agrifood subsectors
- the slow, uncertain and deficient emergence of 'global governance' of resources and global challenges
- local dynamics that enable territorial governance systems to be implemented in a decentralization and local resource management framework, often counteracting with global issues.

With public policymaking for the agricultural sector and the emergence of international regulations, it is essential to focus research on public policies so as to gain insight into: (i) the shift in national regulations towards multilevel polycentrism, (ii) the inclusion of sometimes contradictory dimensions, and (iii) the restructuring of political systems.

'Scaling', 'multilevel' 'global' are conceptually important terms. International/multilateral standards, schedules and commitments may already be set, but it is always local systems that supply the global public goods targeted by these coordinations. Analyses should thus correlate international processes that produce diagnoses, standards and objectives with local development situations in the framework of national systems. Such multilevel analyses can generate insight into linkages between different stakeholders with varied legitimacies and interest, power and knowledge relationships within each of these systems. Since many stakeholders, sites, objectives and conditions are involved in these systems, it is essential to combine many case analyses with interpretations and transversal analyses concerning the development of standards and public policies. Then it is necessary to gain insight into the behavioural and rhetorical standards associated with sustainable development, and their impacts on local management of projects, actions and sectoral policies. The character of relationships between international provisions and those of local and national interest and power would warrant analysis. Assessment of natural resource management conditions highlights gaps or complex linkages between the global and local aspects because the 'governance' of each territory is specifically tailored to local conditions. The importation of standards should not be judged impartially, but rather considered with respect to actual power relationships within territorial 'concrete action systems'.

A set of action domains (ecosystem conservation, fighting poverty, etc.) is grouped amongst the international standards listed under the expression 'sustainable development'. This has given rise to complex cooperation/conflict games and restructuring at the fringes, interstices and margins of sectors, organizations and domains. This questioning of the sectoral architecture by the transversality induced in the sustainable development concept is the result:

- (i) of economic internationalization, (ii) of the increasing weight of supranational policy levels and donors in the application of standards in problem definitions, (iii) of the challenging of former types of regulations between the centre and the periphery involving a rearrangement of the relationships in polycentric and multilevel forms and enhancement of the status of observation and analysis of territorial stakeholder configurations. Governance should be questioned with respect to this latter point, by accounting for the economic, social and political aspects of these new scales of action and their dynamics. The consultation and mobilization conditions of stakeholders and institutions through local democracy promotion initiatives are central to this issue. Transversal analysis is effective for assessing the restructuring of institutional and power relationships between the different public action stakeholders, under the effect of the integration of the action domain and the sectoral strategies adopted with respect to cooperation and conflicts.

Literature on transitions in political systems, especially democratic, favours a developmentalistic analytical scheme. A new system would replace the former one according to the 'one best way' democratization scheme. Most studies on changes highlight that hybridization occurs between inheritance and innovation since these changes involve uncertain interlacing of long-standing public action positions and practices on the one hand, and unfinished innovative tinkering on the other. The hybridization hypothesis shows the more or less conflictual combination of constraints associated with inherited political choices with new globalization requirements and social changes in the societies considered, especially those introduced by sustainable development issues. It also highlights the processes involved in policymaking 'change dynamics' such as in power relationships. These recompositions are reflected by the compartmentalization of social, institutional and political regulations. The territorialization of projects mobilizes stakeholders beyond just national or federal/federated considerations. It structures local action configurations around specific projects supplemented with interpretations of international procedures. All of these phenomena mark an increase in 'partial systems' of regulation of public problems, leading to the fragmentation of societies in both developing and developed countries. We hope to gain further insight into political changes in this direction. The presentations of units conducting research on reshaping public policies highlight that the contributions concern resources, as well as stakeholders and regulations.

**Pierre Valarié (UMR Cepel),
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Public goods, policies and international regulations

Public policies, stakeholder participation and consultation

National and international consultation and negotiation mechanisms are on the increase, in the form of democratic innovations designed to foster public discussions, forums, citizens' juries, etc. The impacts of these procedures may be variable, but the types of participation they promote correspond to changes in power relationships and in how public actions are defined and implemented.

Research carried out by the *Centre d'études politiques de l'Europe latine* (CEPEL, CNRS/UM1) within the framework of its *Démocraties* programme addresses three sets of issues:

- The forms of public action legitimacy, where 'participation' implies a change in political legitimacy, contributing to a power redistribution. CEPEL investigates the impacts of these changes on the strategies of interest groups, large technical bodies and industrial groups.

- These participation systems are managed by public or private, professional or expert stakeholders whose role has never been specifically studied (consultant agencies, think tanks, NGOs, etc.). CEPEL conducts studies to assess the paradoxical professionalization of this field of activities.

- Consultation areas open to concerned inhabitants with the aim of gaining further insight into social and political processes of selection of valid intermediaries and types of public construction.

Associations' roles are interesting from this standpoint as they seem to be mixed. These associations are professionalized and instrumentalized institutional

stakeholder intermediary groups. In other cases, associative circles are structured in a targeted, contextualized and protesting manner, and marginalized in terms of information construction/dissemination and determination of accepted solutions.

These research activities include comparative European and extra-European assessments, especially within the scope of the research of the *Laboratoire Européen Associé* (LEA) ETAPES (*Espaces et Temporalités de l'Action Publique en Europe du Sud*) conducted in southern European areas, and within the framework of the Strategic Monitoring of South American Transformations (SMART) programme with research conducted in the Amazon region.

Public policies, agricultural markets and institutionalized tradeoffs between stakeholders

Poverty, inequality and migration are increasing in most tropical countries, thus questioning the relevance of public policies that were drawn up in the 1980s. These trends affect family farmers, who account for a major share of the work force and generate most of global agricultural production. Moreover, since the conversion of farm workers into other economic sectors is not realistic, the above trends upset social and territorial balances in concerned countries.

The development of public policies that can sustainably balance economic growth and social development is a key challenge. These policies have to be based on institutionalized tradeoffs between public and private stakeholders in order to be acceptable and efficient.

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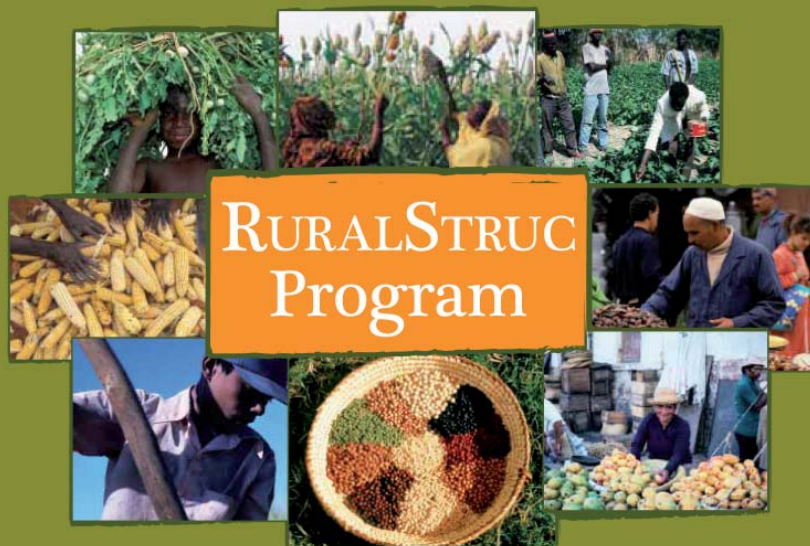
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RuralStruc Program

Structural dimensions of liberalization on agriculture and rural development

The 3-year (2006-2008) RuralStruc Program (World Bank, Agence Française de Développement, Ministère des Affaires étrangères et européennes - France, Ministère de l'Agriculture et de la Pêche - France, International Fund for Agricultural Development, CIRAD) aims to gain insight into the structural dimensions of liberalization processes and economic integration with respect to agriculture and the rural sector in developing countries. The adopted approach is not just limited to trade liberalization, but also includes other features of the change process—domestic reform, state withdrawal, privatization and decentralization, and reshaping of global agri-food markets.

This multidisciplinary RuralStruc Program involves a combination of national and international experts and researchers who conduct comparative studies in seven countries, corresponding to different stages in the liberalisation and economic integration processes (Mexico, Nicaragua, Morocco, Senegal, Mali, Kenya and Madagascar). The Program consists of two main analytical phases: (i) an assessment of the situation in each country (2006-2007), concerning their trajectory of structural change in agriculture

and the rural economy, and (ii) sectoral and regional case studies (2007-2008) based on surveys of rural households. The main themes investigated are:

- Integration processes (vertical and horizontal), their impact on the segmentation of production structures and marketing, especially in terms of concentration and marginalization
- the risks of economic transition impasses associated with these processes in countries where there are few alternatives apart from agriculture
- the reshaping of rural economies in relation to the emergence of composite multilocation activity and revenue systems (nonagricultural activities, migrations, public and private transfers).

The Program is carried out in each country with public policy discussions (between national partners and with donors) and the results provide guidelines for policymaking for the agricultural sector and the rural community.

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The aim of the internal research unit (UPR) Collective Action, Policies and Markets (**ARENA**, CIRAD) is to analyse tradeoffs underlying public policies and market coordinations at different geographical scales and decision levels. Its research project addresses the following key question: In what conditions, and how, are institutionalized tradeoffs between stakeholders developed, and how do they contribute to sustainably improving the functioning of agricultural markets and the development of public policies, promoting an increase in added value, sustainable natural resource management, equity and social

cohesion? The research methods are designed to assess both the individual and the social group with reference to different social and agricultural sciences. They are based on the collection of qualitative and quantitative *in situ* data. Moreover, they involve comparative assessments geared mainly towards understanding historical, territorial, social, economic and political dynamics.

The diversity of research areas enables studies on the different forms of tradeoffs and their recurrences: Latin America (Brazil, Central America, Africa (South and

West Africa), Asia (Indonesia), French overseas regions (New Caledonia, Mayotte). Partners of this UPR include universities, research centres and national and international donors, farmers' organizations, local communities, centralised and deconcentrated government services.

The expected results concern: (i) the production of knowledge on tradeoff development conditions in a broad range of different economic and institutional settings, (ii) the production of approaches, methods and tools to highlight and underpin public policymaking and negotiation. ...

PROPOCID: Context-specific policymaking for sustainable rural development

The *Production des Politiques de Développement Rural Durable dans leurs contextes* project (PROPOCID) is based on the apparent paradox between the exogenous origin of the sustainable development reference frame concerning national states and the fact that this reference frame should be endogenously developed according to national dynamics to ensure its relevant practical application. Sustainable development policies are thus dependent on national debates, the power structure and political autonomy with respect to the economy. Hence, research is aimed at assessing public policies for sustainable rural development in the settings in which they are actually applied, and especially analysing the conditions according to which the new discussions on sustainable development are integrated, negotiated, reinterpreted by interest-bearing parties situated at different public policymaking levels (national, regional, local). A comparative approach to the analysis of public policies applied to a sample of different countries is implemented, while using instruments for the cognitive analysis of public policies and historical institutionalism. The research is conducted along three lines, supplemented with a transversal synthetic analysis:

- (i) a historical analysis of forms of state intervention, (ii) an analysis of the conditions under which sustainable

development is accounted for in agricultural and rural policies of the different analysed countries, and (iii) monitoring the *in situ* sustainable development situation. The national and regional settings assessed have different levels of nation-state consolidation and autonomy with respect to the exterior. The sample consists of two emerging countries (Brazil, Mexico), two least advanced countries (Mali, Madagascar) and two French situations (metropolitan and insular ultraperipheral—New Caledonia). Regional and domestic situations directly concerned by the promotion of sustainability issues in the national political agenda were chosen in each case. The research proposal involves six French teams and nine national teams.

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Public policies, regulation systems and resource-based economies

The Laboratoire de sciences économiques de Richter (**LASER**, UM1) includes three teams:

- the *Centre d'Études de Projets* (CEP), specialized in economic and financial project and public policy assessments
- the *Centre de Recherche en Économie et Droit de l'Énergie* (CREDEN), specialized in energy and environmental economics, and public macroeconomics
- the *Laboratoire d'économétrie*, specialised in econometric modelling.

LASER conducts studies on:

- energy, renewable resource (renewable, nonrenewable, fossil, fisheries, etc.) and environmental economics
- industrial economics and network industries (gas, electricity, telecommunications, etc.)
- financial, technological and industrial risk management

- public decision analysis and local (regional projects) and national (social policies) public policy assessment
- the industrialization of knowledge and public research policies and technology transfers.

Global environmental issues and the precautionary principle

The Center for International Research on Environment and Development (**CIRE**, EHESS, AgroParisTech-ENGREF, ENPC, CIRAD, CNRS UMR 8568) was founded in 1971 with the aim of investigating strategies to improve the relationship between environment and development. This involves highlighting dynamic links between economic regulations and the development of technical environments that have a material impact on growth in public policies. CIRE conducts research on energy, waste, transportation, water and food topics and has been focusing more specifically on global environmental issues (ozone, acid rain, climate



▲ Group of men clearing a plantation field with a hoe (*daba*) while being supervised by a local foreman

► Our Common future (Brundtland Report) by World Commission on Environment & Development (1987)
By permission of Oxford University Press (www.oup.com)



Other teams focused on this topic

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UR 199
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Integrated natural resource management in Latin America

The aim of this multidisciplinary programme is to compare current changes in public policymaking and implementation with respect to natural resource management (water, biodiversity in coastal areas) on the basis of field observations in the Latin American Southern Cone region. New conditions resulting from provisions of international agencies are highly integrated on a territorial level and foster local inhabitants' participation.

The research involves testing the hypothesis that the public action reshaping under way involves a process of hybridization: between conventional government regulation and innovative tinkering; between international provisions and territorial projects; between standard action sectors and integration of their rationales; and between elective territories, problematic/project territories and administrative territories. The research is thus focused:

- on three 'trans' variables that highlight hybrid reshaping of public action: multilevel transfers of public management provisions and 'reasons to act', *trans*-sectorality of environmental public action mechanisms, *trans*-territoriality of management mechanisms
- on the emergence and development of stakeholders who serve as mediators for hybrid reshaping and who we call 'public action middlemen' (scientists, experts, NGOs, etc.) in a global change setting with highly varied local manifestations.

This programme is part of several projects (Agriculture and Sustainable Development, CNRS *Énergie*, etc.) carried out in collaboration with CIRAD, INRA and IRD research teams.

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Agroforestry systems in Latin America

J. Imbernon © CIRAD

change) and the precautionary principle since 1988.

In addition to its teaching activities, CIRED's research is organized according to six themes:

- Prospective studies of links: development-mining the natural capital. Development of growth models integrating consumption styles, technological choices, locations and environmental constraints
- Environmental risk and vulnerability of societies. Environmental costs, natural catastrophes, impacts of climate change and adaptation (water, towns, infrastructures, agriculture)
- Models combining economics and land systems. Integration of growth models that combine imbalances with reduced forms of environmental science models

- Decision making in controversial settings. Sequential decision models and the precautionary principle, interactions between inertia and uncertainty, the value of meteorological information
- Public economy tools. Sustainable development and infrastructure regulation (electricity, transportation, water, housing), taxation, competitiveness and employment
- Political economics of negotiation. Deliberation processes and local/global integration, climate negotiation and global governance (WTO, energy security).

CIRED has been participating in appraisal reports on climate change of the Intergovernmental Panel on Climate Change (IPCC) since 1992. The Center was also involved in the First Assessment Report (FAR, 2007). In addition, it was part of the official

French delegation participating in the IPCC Assessment Report government approval meetings.

The Imaclim-R model, which can simulate long-term scenarios concerning energy system patterns and assess the efficacy of greenhouse gas emission reduction policies, was developed in 12 regions worldwide and 12 economic sectors. It was combined with a model of the International Energy Agency (IEA, Paris) for the World Energy Outlook, which updates the 2005-2030 projections for economy and energy in China, India and the World. This 'prospective modelling and sustainable development' is CIRED's priority. The Center has also helped the Ile-de-France region allocate its first €3.5 M budget to 46 teams in the regional sustainable development network. ...



Thio mine, New Caledonia

G. Van Vliet © CIRAD

Democratic engineering and large technical projects

ensure the interface with their ecological and societal environment. However, the programme also shows how industrial operators, as their spokesmen often claim, are unwilling just to go along with the regulations. These private interest groups put forward the mottos 'industrial environment', and now 'sustainable development', and have a substantial impact on public action in this area.

Cases concerning the cement manufacturing industry and the very high tension power line manufacturing industry are the focus of many studies in France. This first national level should be centred on a research programme concerning the governing of industries on a European level to assess the position of industrial stakeholders in the political quest to define objectives associated with sustainable development at this level (coordinated by the laboratory of the Institut d'Études Politiques de Bordeaux and submitted to ANR in March 2008).

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Sustainable development, governance and public action

The *Centre d'étude et de recherche sur les transformations de l'action publique* (CERTAP, UPVD) carries out many studies on the sustainable development, governance and public action theme, which represents one of its four lines of research. Sustainable development is a major paradigm underlying the development of public policies and the format of political talks—reconciling resource preservation for future generations, enhancing resource use efficiency, and fairly distributing these resources within society. The introduction of this concept in the field of public action has prompted many changes: in the legitimacy of public action, its institutional and economic environment, its legal framework,

in drawing up its objectives and priorities, in decision making methods and in public action organization strategies. French public rights have been markedly affected by these changes, which provide researchers with a novel approach to legal research, highlighting changes in legal regulations. Based on a rational approach to French administrative organization, an analysis framework was developed and is being implemented to assess relevant monographic applications on national, European and developing country levels.

CERTAP is focusing many studies on the sustainable development topic, especially with public rights disciplines (particularly domestic, community and international public rights and public administration). Public policy analyses enhance this approach and broaden the

scope of the research on this theme by including some political science tools. Studies are under way to investigate transformations in economic administration, decentralization, state reforms and bureaucratic changes via deconcentration processes.

The increasing role of civil society in the management of public action is a further focus of research. The administration of developing countries, the comparative rights of European administrations, the administration of emerging countries, privatizations, and public service reforms under way in the EU framework are also being studied. Food health policies, the administration of maritime fisheries and of protected marine areas are also being promoted through international expert appraisals and multidisciplinary research contracts.



Agrimonde prospects: balancing global food and agricultural systems by 2050

Agrimonde was launched as a joint CIRAD-INRA initiative under the aegis of the public interest group *Initiative Française pour la Recherche Agronomique Internationale* (GIP IFRAI). It represents a tool for collective assessment of global food and agricultural issues, which can be summed up as follows: How will it be possible to feed 9 billion people in 2050 while preserving the ecosystems from which other products and services are expected (carbon storage, biodiversity, biofuels, biomaterials, etc.)? The prospective analysis also aims to pinpoint key issues that agricultural research will have to deal with in the future. This initiative provides both CIRAD and INRA with a means to contribute to international discussions on food and agricultural issues, and also to prepare future research orientations.

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At the crossroads of research and decision making

The *Institut du développement durable et des relations internationales* (IDDRI) is an independent institute at the crossroads of research and decision making. It provides effective advice on sustainable development policy issues on the basis of scientific findings. It focuses research on key issues, including changes in development models prompted by natural resource degradation and climate change.

Its approach is based on three hypotheses:
 ■ Global changes induced by human activities are ultimately unsustainable

■ Current development models need to be completely overhauled
 ■ This overhaul process is possible if consistent global policies are implemented to induce timely essential lifestyle changes.

IDDRI's mission is threefold: to provide decision support and advice, identify future issues, and coordinate discussions between stakeholders whose interests often differ. The Institute fulfils this task by bringing together the stakeholders involved, foreseeing future questions and specifying the issues. Its teams conduct research within the framework of a large international network. This facilitates gaining shared insight into problems by placing them in a global perspective.

IDDRI conducts research and studies with the joint participation

of researchers, partners from the scientific community, companies and decision makers. This unique approach fosters pooling of the expertise of all of these stakeholders.

IDDRI promotes scientific research by organizing conferences, symposiums, workshops and seminars and through its website (www.iddri.org), which provides access to study and information documents, publications from IDDRI collections—analyses, ideas, syntheses—and from other publishers. Since November 2007, an electronic version of the *La lettre de l'iddri* has been published regularly to provide further information on IDDRI's activities and news, and to highlight important facts concerning sustainable development worldwide. ■



R. Ducrot © CIRAD

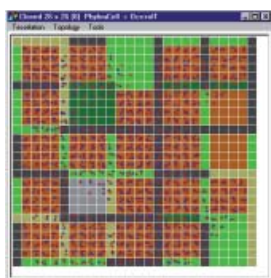
Larq'asninchej role playing game to assist in canal management with rural and urban users in Cochabamba region, Bolivia

Methods and tools tailored *to a diverse range of issues*

Social science—combined with biological and engineering science—is an integral part of the multidisciplinary research conducted by Agropolis.

These teams implement complementary research methods, ranging from comparative comprehensive strategies to more formal approaches using tools and instruments that represent or model interactions between socioeconomic and biological systems.

An example of a support modelling approach: co-construction of the PHYLOU model



Within the framework of the European Freshwater Integrated Resource Management with Agents project, which is focused on the development of multiagent integrated water resource management models, UMR G-EAU and UMR TETIS researchers jointly developed, in collaboration with representatives of several institutions involved in water resource

management in the Orb catchment (France), a model of a subcatchment (Taurou) and impacts of diffuse pollution derived from viticulture. Co-construction of this model involved a series of five formal meetings that gave rise to a model which provides a novel viewpoint on the key issues to benefit researchers as well as field stakeholders. By this approach, the landscape is considered as a modelling parameter; with different types of landscape identified in the catchment basin, such as the 'terraced-plateau' landscape. The simulations revealed pollution propagation patterns for each type of landscape. These could be used to boost farmers awareness on the importance of the diffuse pollution issue within an area, and to stimulate collective discussions on the topic.

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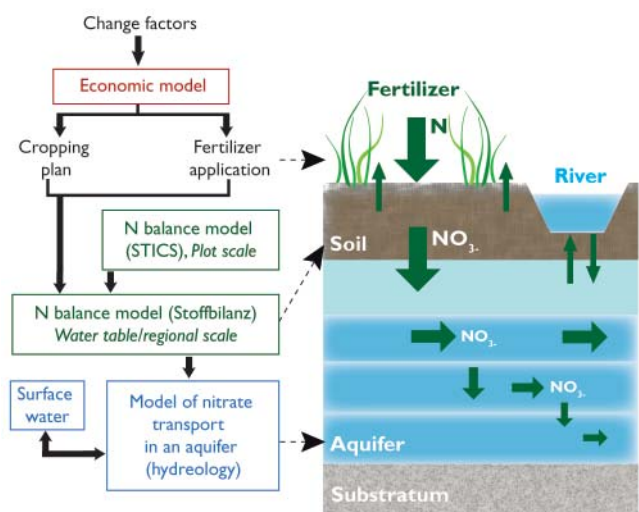
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F. Cernesson © Engref-AgroParisTech

▲ *Photo of a 'terraced-plateau' landscape*
◀ *Simulation of pollution propagation over this type of landscape. The selected spatial scale is a group of 1 ha plots. The colours indicate different landuses (bare soil, vines, grassland, forest, grassy strip, trail, ditch, hedge). The coloured dots represent two types of pollution molecule.*

Long-term prospective agricultural analysis and potential groundwater quality scenarios: a combined-modelling approach



Example of an integrated model

Within the framework of the French-German MONIT project (Modelling of groundwater contamination by nitrates in the Upper Rhine Valley, InterReg programme), a modelling platform combining economic, agronomic and hydrogeological modules was developed to simulate long-term variations in agricultural production, nitrate emissions and in the resulting groundwater quality in the Upper Rhine Valley (Switzerland, France, Germany). Different global change scenarios were developed through a French-German expert group. The scenarios are based on hypothesised variations in agricultural markets, European agricultural policies, energy prices, agrofuel development and changes in the natural environment. The impacts of these changes on cropping patterns are simulated using linear programming models combined with nitrogen balance and hydrogeological models. The simulations indicated an overall decrease in groundwater nitrate levels.

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M. Soulié © Agropolis International

Highlighting through comparison

Comparative linguistics in social science research of the *Pôle Agronomique* a shared research and expertise field and network-based training

Many of the operations and studies presented in this dossier include a comparative dimension that contrasts with the national restraints from which this methodological approach derives. In this respect, such research contributes to and participates in a global contemporary social science movement, whereby comparative analyses are recast on a more global scale, i.e. transnational and transdisciplinary. This integration addresses several overlapping phenomena:

- Advances in processes and transnational socioeconomic impacts associated with economic globalization and multilevel and transectoral governance issues that they give rise to in terms of observation and analysis, and with respect to public policymaking beyond national borders.

- In response to these changes, the increased demand of research and knowledge sponsors leads to and promotes the formation of international networks of researchers from different geocultural areas and disciplines.

- To be analysed with respect to its different dimensions and impacts (economic, social, ecological, political, etc.), sustainable development—a purely

transient concept—must be approached by going beyond inherited disciplinary nationalistic cognitive frameworks, and reassessing comparative methods and approaches with respect to the relevance of choices of spatial scales and process monitoring/analysis temporality (diachrony/synchrony, prospective analysis, etc.). Because of its polysemic diversity, different common intercommunicating guideline frameworks must be constructed on the basis of objects and problems shared by the different researchers.

Within the scope of the 'Societies and sustainable development' field at Agropolis International, the favourable conditions foster the renewal and enhancement of the comparative analysis approach. It represents a forum for discussion and a source of expertise that could be tapped for unique critical assessments on the transferability of mechanisms and action systems, collective initiatives and public policies in this domain.

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A guide to sustainable development indicator co-construction practices: the EVAD research project

Within the framework of the *Évaluation de la durabilité des systèmes aquacoles* (EVAD, ANR Agriculture and Sustainable Development project), a multidisciplinary research team designed a generic guide to practices aimed at facilitating the construction of sustainable development indicators for the aquaculture sector based on field research conducted in five countries representative of the diversity of aquaculture systems (France, Cyprus, Cameroon, Indonesia, Philippines). The guide proposes a co-construction scheme via partnership research based on the assumption that concerned stakeholders and a collective learning process are required for sustainable development to work. It jointly deals with the question of aquaculture farm sustainability and the contribution of aquaculture to sustainable territorial development.

The proposed approach enables users to develop indicators according to principles and criteria that account for the functioning of aquaculture production and regulation systems, as well as aquaculture areas and ecosystems. Representations and practices of stakeholders mobilised through surveys and focus groups can thus be the starting point for the classification of checklists drawn up and designed to be generic and applicable to all types of aquaculture systems.

The focus is on organizational and institutional conditions of the collective learning process. Indicator selection and development thus seems to represent a reflexive action and an intermediate 'mediator' feature to facilitate sustainable development.

The proposed guide is a decision support tool that, according to decentralised sustainable development implementation phases, (i) provides a tool for managing information and existing indicators, (ii) facilitates the appropriation of sustainable development through the co-construction of indicators, (iii) initiates the sustainable development institutionalization process through collective learning, and (iv) participates in strengthening conditions for the professionalization of sustainable development and governance associated with its territorial implementation as recommended in local agendas.

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Comprehensive social science approaches

Comprehensive social science approaches are based on theory, but also on a data input method. The scientific aim is to develop contextual explanatory models of complex changing situations, involving heterogeneous stakeholders who meet and negotiate through different action logic combinations. These approaches consider actions and practices of social stakeholders (individual or collective), while accounting for their views on their situations and options open to them, their objectives, logics, motives, values and action principles to which they refer. From this perspective, they approach situations and facts that are analysed as derived from processes.

This process dimension of comprehensive approaches helps to unravel the complexity of social, political and economic relationships, and the institutions ('rules of the game') that underlie the organization. The choice of a comprehensive process-based approach thus orients contextualized research at different interaction levels, i.e. from national to local scales.

The results are interpreted from these different observation and analysis scales according to the research questions considered. In studies on land relationships (used here as an example), the empirical dataset used can thus combine a limited description of local microinteractions (e.g. in cases of intrafamilial land relationships or extrafamilial transfers), a broader description of mesoprocesses incorporating a portion of a broad interpretation (e.g. in cases of relationships between a village land area and the relationship dynamics between generations or 'local state' authorities), and a broad



interpretation of macroprocesses concerning institutional environmental elements (e.g. the legal set up, public policies and interventions in the land and migration fields, the history and political economics of agrarian changes, local ownership policies and identity issues).

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Agriculture for development

Agriculture for Development is the topic of the World Development Report 2008. Every year the World Bank publishes a report on a development domain or issue. The most recent previous report on agriculture had been published in 1982! At the request of the Report's

writers, and with the

support of the French *Ministère des Affaires étrangères et européennes* (MAEE), *Ministère de l'Agriculture et de la Pêche* (MAP) and the International Fund for Agricultural Development, several CIRAD researchers (from UPR ARENA, UMR MOISA) facilitated a collective appraisal process by collecting and supplying material to draw up a report on the role of farmers' organizations in current and future changes in agriculture.

The initial request was to review knowledge on this issue, prepare and facilitate discussions with concerned stakeholders (heads of farmers' organizations). The CIRAD team:

- Wrote six scoping notes on the topic, in collaboration with Dutch specialists for two of them. These notes included a knowledge update on a specific aspect of the issue (farmers' organizations and market access, farmers' organizations and public policies, etc.) and a review of case studies and examples illustrating innovative initiatives in the target domain.

- Prepared and coordinated a 2-day workshop with some 40 participants, including head agriculture staff from Africa, Asia and Latin America.

- Wrote a summary of the key ideas covered in the scoping notes and the workshop deliverables.

The knowledge and evidence generated on farmers' organizations through this process provided key material for drawing up the World Development Report. This work strengthened the writers' conviction that farmers' organizations are a crucial constituent in development strategies utilizing agriculture as a lever to combat poverty.

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Partnership research on agricultural areas and activities in the *Communauté d'Agglomération de Montpellier*

In 2003, the Innovation and Development in the Agriculture and the Agrifood Sector research team (UMR INNOVATION) signed a convention with the *Communauté d'Agglomération de Montpellier* (CAM) to carry out a diagnostic analysis for the *Schéma de cohérence territoriale* (SCOT) urbanism plan. CAM required an analysis of agricultural areas to "assess potential changes in the limits between urban, agricultural and natural areas so as to be able to design an urban plan that integrates and complies with the economic and landscape imperatives of agricultural areas that contribute to the diversity of the community territory".

The analysis, which was based on the mapping of agro-physiognomic units, led to a description and interpretation of the spatial distribution of around 20 landscape units in terms of current uses and change dynamics. Key elements concerning stakeholders and agricultural areas that should be accounted for in SCOT plans were highlighted, including agricultural territory dynamics, viticultural diversity, landscape quality of agricultural areas, etc.

A first assessment of this partnership research experience focused on the way the study was adopted by the partners

and implemented in the territorial project, along with the spatial planning approach. The landscape units enhanced the typical urbanistic view by providing details on what are usually classified simply as 'white areas' (i.e. natural and agricultural areas) on urbanization documents. The resulting maps were integrated by engineering and design offices working on conceptual designs in preparation for the SCOT plan. Preservation of agricultural areas is a consensual argument in favour of habitat densification—a major target of SCOT.

This analysis revealed a gap between the diversity of the periurban agricultural environment and its representation in discussion and working bodies. Conflicts of interest between different agricultural stakeholders, a lack of awareness and organization to cope with new challenges and territorial governance arrangements limited the involvement of professional participants in the first phase of SCOT development.

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The Reform of the Common Market Organization (CMO) for Wine: seeking alternatives for collective European action

Professionals in the vitiviniculture industry and European Commission bodies are seeking alternatives to boost the competitiveness of European wines on the world market. The European Parliament asked UMR MOISA to conduct a study on the reform proposed by the European Commission, with: (i) a review of the wine market in European Union-25, (ii) an assessment of the shortcomings of the wine CMO mechanisms, (iii) an analysis of the Commission's reform proposal, and (iv) wine CMO reform proposals.

This study involved 17 researchers from seven countries: the main European wine producing countries (France, Italy, Spain, Hungary), two non-European competitor countries (Australia, Argentina) and a major consumer country (England). UMR MOISA focused on viticulture economics, Common Agricultural Policy mechanisms and the experience of other CMOs. In addition to this study, the coordinators supplied the services of the European Deputy Katarina Batzeli with briefing and analysis notes in real time to address requests as they arrived.

The Report presented to the European Parliament was based on these studies, and the main conclusions were as follows:

■ The policies applied for several decades are no longer tailored to the situation, especially the policy implemented during the 1980s which promoted the systematic elimination of vineyards. A more targeted uprooting (or grubbing-up) programme guided by a voluntary cost-effective policy that is both economic and social would be necessary.

■ Distillation schemes should be reassessed. They are compartmentalised and costly because of the way they are structured. The outlet for wine alcohol has been administered

without price review for over 20 years. It would be essential to take the environmental, ecological and energy aspects into consideration.

■ Some 40 vitiviniculture enterprises currently dominate the world market. The bargaining power and dependency of downstream industry stakeholders will be governed by the emergence of leading companies in each region or production area. Governmental bodies should foster an offensive market strategy by supporting companies via farmers' organizations and economic committees.

■ Assessment of the CMO shortcomings should be focused especially on the adaptation of its mechanisms, in terms of the CAP objectives or viticulture policies, or of world market competition trends with the domination of new wine producing countries. It would be crucial to set and classify the objectives and means before eliminating any existing instruments.

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For further information: www.montpellier.inra.fr/moisa/bartoli/download/moisa2006_pdf/OCMvin_fr.pdf



© C. Maitre

Couhins viticultural research station, Bordeaux



Amphibious flood rescue vehicle

M. Soulié © Agropolis International

The competitiveness cluster 'Gestion des risques et vulnérabilités des territoires' ('Risques' cluster)

The competitiveness cluster 'Gestion des risques et vulnérabilités

des territoires' pools research and training companies and institutions focused on risk related topics. The work is conducted in the French regions of Provence-Alpes-Côte d'Azur and Languedoc-Roussillon and in other areas worldwide, dealing with natural risks, as well as industrial hazards and risks associated with urban development.

The aim of this cluster is to label, financially support and implement research and development projects to promote the development of innovations that fulfil market needs.

Risk markets and their needs therefore must be identified. Three approaches have been developed:

■ A territorial approach. Current progress on sensors and new information and communications technologies should enable major advances in risk management. Risk prevention and the

protection of property, life and heritage is now the focus of major laws and substantial investment, which means that risks are mainly managed through a public market in which the government and local authorities are involved. This has given rise to territorial risk management systems, enabling cross-sectoral and multirisk management since any given area can be susceptible to several types of risk.

■ An approach associated with industrial innovations. Innovative technologies now have to comply with European regulations on risks and the environment, be socially acceptable and accepted by opinion leaders and prime contractors. The cluster proposes to use technology platforms that are already set up in the two regions to assess the clean and safe features of technological innovations.

■ A training and consultation approach. There is also an important psychosociological aspect to risk. Societies and individuals have highly variable degrees of acceptance or aversion with respect to risks. Training-information-consultation initiatives are required to take this dimension into account, and these could also be a source of economic development.

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Sustainable development and climate change in Languedoc-Roussillon region: key factors, trends and risks

Within the scope of the *Plan d'Action Stratégique de l'État (PASE)* implemented in Languedoc-Roussillon region (France) over the 2009-2011 period, the Prefecture of the region asked Agropolis International to coordinate a study that brought together all scientific expertise of the region specialised on issues concerning sustainable development and the impact of climate change in Languedoc-Roussillon. The method hinged on six themes covering around 20 topics related to key areas of consideration outlined in the Grenelle Environment Forum. Agropolis International assigned one expert per topic who was responsible for drawing up a summary report. This gave rise to nine initiative proposals:

1. To create a capacity for regional prospective assessment associated with initiatives under way in neighbouring regions and integrated on national and European levels.
2. To create a sustainable development observatory in Languedoc-Roussillon focusing on general indicators integrating climate change aspects and risks specific to the region.
3. To set up support instruments to facilitate management of crises associated with natural, sanitary and anthropogenic risks.
4. To ensure that, within the scope of all of these development instruments, new people arriving for permanent residence in the region (elderly people, students, etc.) will be appropriately hosted and their living standards safeguarded.
5. To support all subsectors that could give Languedoc-Roussillon a comparative advantage, e.g. solar energy and Mediterranean gastronomy.
6. To enhance higher education and research by strengthening the development of collective research platforms and partnerships.



Coastal lagoon preservation and production: Thau lagoon

M. Soulié © Agropolis International

7. To safeguard and promote local biological and heritage diversity.
8. To develop integrated urbanism policies, including training in public works and civil engineering, energy saving and renewable energy recovery.
9. To enhance the image of Languedoc-Roussillon based on the European 'solidarity-integration' model.

This collective study generated operational responses to a complex issue. It was also very beneficial that a tangible result was obtained by pooling expertise that is seldom mobilised in unison.

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Contribution of research to competitiveness clusters: the Q@LI-MEDiterrannée cluster

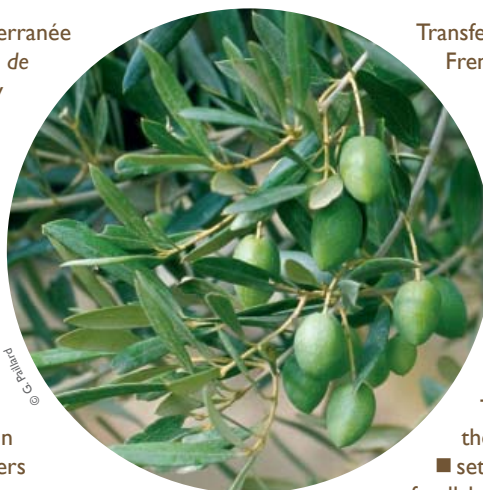
The competitiveness cluster Q@LI-MEDiterrannée 'Systèmes agroalimentaires durables et qualité de vie en Méditerranée' was founded on 20 July 2005. Its strategy is based on the following guiding principles:

- pooling of scientific, technical and training resources
- strengthening partnerships between research and development stakeholders and economic stakeholders
- broadening the scope to the Mediterranean region and other areas worldwide.

The cluster's activities are structured within four general work areas in which researchers and companies collaborate:

- plant breeding
- fresh and processed product safety and traceability
- food, diet, nutrition and health
- territorial agrifood marketing.

The cluster is managed by a president, who is also a company manager, with a 14 member office staff. An operational unit implements the strategy, supported by Agropolis International, the *Association régionale des industries agro-alimentaires du Languedoc-Roussillon (ARIA-LR)*, the *Fédération régionale des coopératives agricoles (FRCA)*, Saint-Charles International and



© G. Rialat

Transferts-LR. The cluster is funded mainly by the French government and local authorities.

Since September 2005, 31 collaborative projects have been set up through Q@LI-MEDiterrannée, involving over 100 partners. The total funding for projects currently under way is €17 million. These are collaborative R&D projects or collective initiatives that come within the strategic scope of Q@LI-MEDiterrannée.

The main initiatives planned in 2008 are in the following areas:

- setting up a process for the development of collaborative structuring projects, focusing especially on the regional economic impact
- enabling members and the region to benefit from the legibility provided by the competitiveness cluster
- strengthening inter-cluster cooperations so as to give rise to common interest programmes
- strengthening international cooperation initiatives, mainly in the Mediterranean region.

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Topics covered by the research teams

(July 2008)

Research units and teams are mentioned on the following chart in order of appearance in this document.

1. Territorial dynamics and changes in production systems
2. Subsectors, standards, markets and stakeholder strategies

3. Environment and natural resource management
4. Public goods, policies and international regulations

Unit	1	2	3	4
FRE CNRS 3027 MTE - Mutations des Territoires en Europe (CNRS, UM3, UPVD) Geneviève Cortès	•		•	
EA 3766 GESTER - Gestion des sociétés, des territoires et des risques (UM 3) Jean-Marie Miossec	•			•
UMR INNOVATION - Innovation and Development in the Agriculture and the Agrifood Sector (Montpellier SupAgro, INRA, CIRAD) Hubert Devautour	•	•	•	
UPR Livestock Systems and Animal Product Management (CIRAD) Didier Richard	•			
UMR TETIS – Spatial Information and Analysis for Territories and Ecosystems (CEMAGREF, CIRAD, ENGREF/AgroParisTech) Pascal Kosuth	•		•	
US ESPACE - Expertise et spatialisation des connaissances en environnement (IRD) Frédéric Huynh	•		•	
UMR MOISA – Markets, Organizations, Institutions and Operators' Strategies (Montpellier SupAgro, CIHEAM/IAM.M, CIRAD, INRA, IRD) Étienne Montaigne	•	•	•	•
EA 4189 CR2M - Centre de recherche sur le management et les marchés (UM1, UM 2) Patrick Sentis		•		
EA 731 CREGOR - Centre de recherche en gestion des organisations (CIRAD) Bernard Fallery		•		
EA ERFI - Équipe de recherche sur la firme et l'industrie (UM 1) Frédéric Le Roy	•	•	•	
UR 199 - Dynamiques socio-environnementales et gouvernance des ressources (IRD) Geneviève Michon	•		•	•
UR 47 GREEN – Management of Renewable Resources and Environment (CIRAD) Martine Antona			•	



Agualoca role playing game, a water resource management support tool for a catchment in Brazil

R. Ducrot © CIRAD

Unit	1	2	3	4
UMR G-EAU – Water Resource Management, Actors and Uses (AgroParisTech/ENGREF, CEMAGREF, CIHEAM/IAM.M, CIRAD, IRD, Montpellier SupAgro) Patrice Garin	•		•	•
UR Eau-RMD, Évaluation de la ressource en eau, milieux discontinus (BRGM) Jean-Daniel Rinaudo			•	
UPR 36 – Forest Resources and Public Policies (CIRAD) Alain Billand	•	•	•	•
URP 68 - Pastoralism (CIRAD, ISRA, ENEA, UCAD, CSE) Amadou Tamsir Diop & Bernard Toutain	•		•	
UPR 22 AGIRS - Animal and Integrated Risk Management (CIRAD) François Monicat	•	•	•	
UMR 5474 LAMETA - Laboratoire montpelliérain d'économie théorique et appliquée (Montpellier SupAgro, CNRS, INRA, UM1) Marc Willinger			•	•
UMR 5112 CEPEL - Centre d'études politiques de l'Europe latine (CNRS, UM1) Hubert Peres			•	•
UPR ARENA – Collective Action, Policies and Markets (CIRAD) Denis Pesche	•	•		•
EA 2039 LASER - Laboratoire de sciences économiques de Richter (UM 1) Jacques Percebois				•
UMR CIREN – Center for International Research on Environment and Development (EHESS, AgroParisTech-ENGREF, ENPC, CIRAD, CNRS UMR 8568) Jean-Charles Hourcade				•
CERTAP Centre d'étude et de recherche sur les transformations de l'action publique (UPVD) François Feral		•		•
IDDRI - Institut du développement durable et des relations internationales Laurence Tubiana			•	•

Montpellier Social Sciences and Humanities Research Institute

Merging forces in social sciences and humanities

The French city of Montpellier and its region have developed a reputation as a site where advanced research is carried out in the fields of health, agriculture and science in general. The social sciences and humanities research community in Montpellier and region, which includes almost 2,000 professionals, researchers, personnel and PhD students, decided to collaborate and pool its forces to deal with major development issues, which underlie its strength and uniqueness. By founding the Montpellier Social Sciences and Humanities Research Institute (MSH-M), these researchers created a space for globally-oriented learning and joint research to benefit mankind and development.

A forum for the creation of 'know-how' and a platform for social sciences and humanities research

The key objectives of the Montpellier Social Sciences and Humanities Research Institute are as follows:

- to support multidisciplinary social sciences and humanities research
- to set up and support teams collaborating on common research topics of the units involving researchers from different disciplines along with their partners from European, Mediterranean and tropical regions
- scientific, educational and cultural dissemination and promotion
- to provide training through research
- to promote partnership development
- to increase international exchanges of scientists and students and develop international research networks.

MSH-M brings together social sciences and humanities research units from universities in the region, Agropolis International and CNRS, along with associated PhD institutions. It is thus becoming a driving force within the complex of universities in Montpellier and the region for social sciences and humanities research, while also being a crossroads for encounters between society and the research community.

Current research issues to shape tomorrow's world

MSH-M—as part of the French *Maisons des sciences de l'homme* network—is mainly a breeding ground for research, action and interaction between pluralistic European and Mediterranean entities.

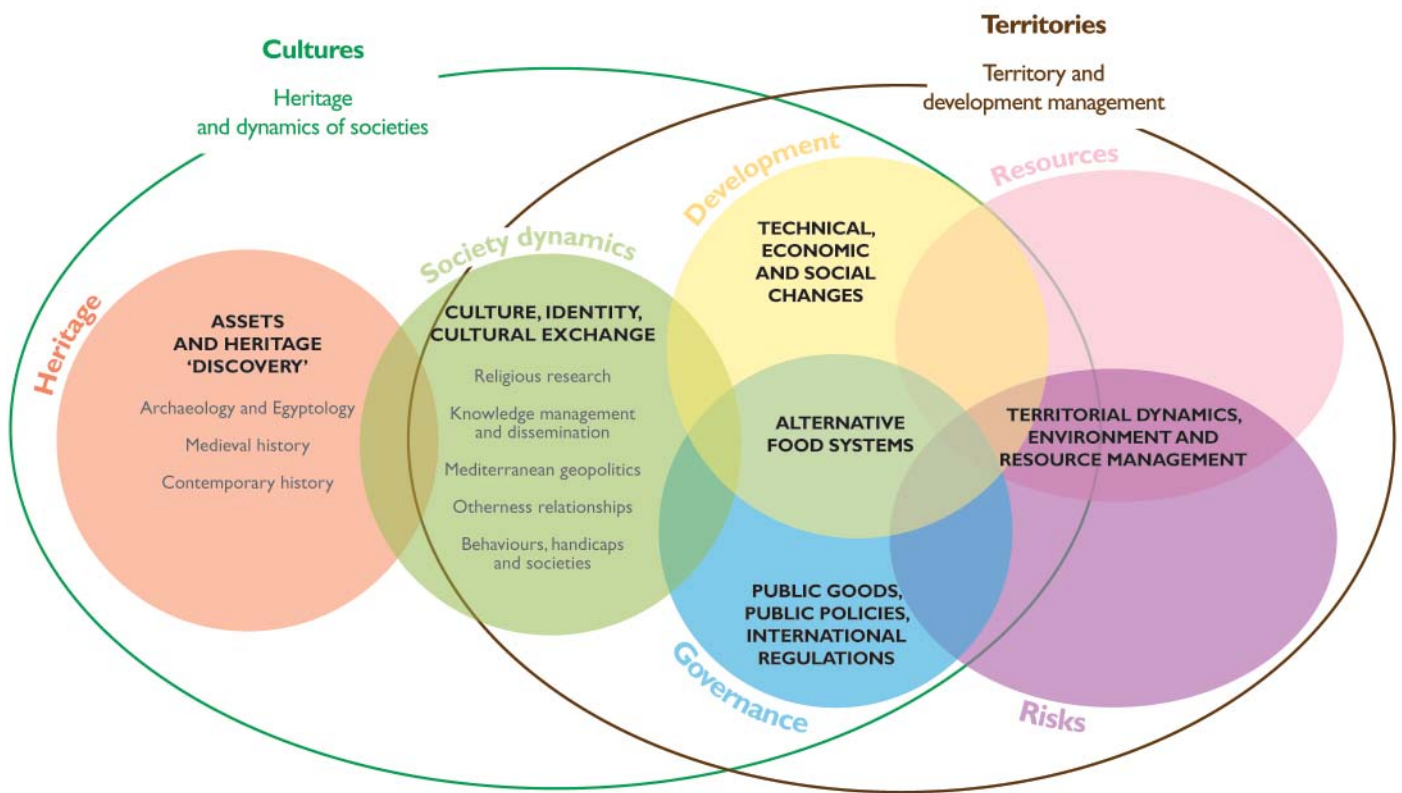
Sustainable and balanced development of the European-Mediterranean region is now essential to ensure equilibrium and stability in a globalization setting. Research teams participating in this project, in collaboration with European and Mediterranean partners, fully intend to contribute to building this area, by:

- encouraging interdisciplinary collaborations between stakeholders, researchers and teachers in the social sciences and humanities field in developed and developing countries
- initiating new research initiatives in partnership with all stakeholders who are active in the field
- contributing knowledge and expertise towards building an 'area of peace and shared prosperity'.

The two 'cultures' and 'territories and development' research areas are geared towards promoting complementarities, pooling expertise and creating synergies within the scope of multidisciplinary research, training and cooperation programmes. The concerned

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*Organization of the Montpellier
MSH scientific community*

disciplines encompass an area that is conventionally occupied by social sciences and humanities. This relative diversity is organized:

- spatially, since it involves fostering the analysis and understanding of 'Euro-Mediterranean interaction dynamics' so as to be able to better design and sustainably build tomorrow's globalized and pluralistic world
- to promote sustainable local development on the basis of stakeholders' willing involvement and unique local features and know-how.

A multisite campus

MSH-M is located in the centre of Montpellier and is part of the *Pôle de Recherche et d'Enseignement Supérieur* (PRES). It serves as a multisite campus, parts of which are located throughout Languedoc-Roussillon region and linked via a network. It is thus:

- a site for the development, capitalization and dissemination of 'knowledge and expertise'
- an area where research teams obtain monitoring and management support
- an area for training on (and via) social sciences and humanities

research, while promoting innovation and involvement in society-related issues and multidisciplinary. Civil society and secondary school teachers could benefit particularly from these initiatives

- a platform where 'restoration' and 'promotion' activities confirmed by MSH-M merge and are implemented. This platform serves as an interface between social sciences and humanities research and civil society
- a site for the development of modern 'knowledge and expertise' that is closely linked to society and has a global scope.

A platform for training on (and via) research

The research support and organization project links knowledge generation and PhD training sites. MSH-M contributes to enhancing the training quality by merging these two features. It fosters the presence of young researchers in research teams by promoting their dynamics and renewal. A specific area within MSH-M is thus devoted to PhD institutions.

The broad range of situations encountered and exchanges between

different disciplines epitomizes the identity, wealth and strength of this approach. This aim to broaden the horizons has given rise to close collaborations between MSH-M researchers and their colleagues in other European and Mediterranean regions, developed and developing countries, while encouraging them to exchange views on multiple and complex real situations.

This commitment to exchange and sharing aims to offset the possibility of unwanted cultural partitioning: 'geostrategic bipolarisation' or '*pensée unique*' (neoliberal 'one-way polarised thinking'). It boosts networking awareness and helps to develop essential mechanisms of exchange, heritage and cultural crossovers that build the societies in which we live. In the construction of our future, it highlights the importance of placing mankind at the centre of these strategies, as a key stakeholder and focus of sustainable development. ■

Agropolis International training and education

in the field of Societies and Sustainable Development

Agropolis International, proposes a complete training-education programme provided through its member institutions, universities and engineering schools (as well as vocational training institutions).

The training-education programme includes more than 80 diploma courses (from BAC +2 to BAC +8: technician, engineering degree, Master's, PhD), as well as vocational training modules (existing or developed upon request).

The tables below outline the training-education courses related to this domain. They specify the diploma levels, a description of the training and the institutions where the training is provided.

Training-education programme

Focused entirely on the Societies and Sustainable Development theme

Level	Degree	Title	Institution
Bac +3	<i>Licence professionnelle</i> (BSc with professional scope)	Sustainable land and resource planning and development	UPVD
Bac +5	<i>Diplôme d'Université</i> (University diploma)	Territorial management and sustainable development	UM1
	<i>Ingénieur</i> (Engineering)	Agricultural engineering – Specialization ‘Territories and resources: public policies and stakeholders’)	Montpellier SupAgro
		Agricultural engineering – Specialization ‘Management of water, cropping areas and the environment’	Montpellier SupAgro
	<i>Master européen</i> (European MSc)	Sustainable development in agriculture / <i>Développement agricole durable</i> (AGRIS MUNDUS)	Montpellier SupAgro et IRC, 5 European universities
	<i>Master of Science</i> (MSc)	Rural development	CIHEAM/IAM.M
		Agrifood subsectors and stakeholder strategies	CIHEAM/IAM.M
		Agriculture and food public policies and choices	CIHEAM/IAM.M
	<i>Master professionnel</i> (MSc with professional scope)	Production systems and sustainable development – Specialization ‘Rural agrifood enterprise strategies’	UM1
		Environment - risk - Specialization ‘Law and environment and sustainable development management’	UM1
		Territories and societies, planning and development - Specialization ‘Rural development stakeholders in hot regions’	Montpellier SupAgro / IRC, UM3
		Territories and societies, planning and development - Specialization ‘Information systems and geographical information for territorial management and governance’	AgroParisTech/ ENGREF, UM2, UM3
		Territories and societies, planning and development - Specialization ‘Management of rural areas, local planning and development’	UM3
		Territories and societies, planning and development - Specialization ‘Environmental engineering and sustainable territorial development’	UM3
		Territories and societies, planning and development - Specialization ‘Tourism and sustainable territorial development’	UM3
		Social sciences and humanities, Category ‘Mankind, landscape, territories’ - Specialization ‘Urbanism, habitat, planning’	UPVD



I.Touzard © Montpellier SupAgro

Formulating a farmers' training request, Benin

Level	Degree	Title	Institution
Bac +5	<i>Master recherche (Research MSc)</i>	Production systems and sustainable development - Specialization 'Economics and geography of development'	UM1
		Production systems and sustainable development - Specialization 'Agriculture, food, sustainable rural development'	UM1
		Rural and agrifood economics - Specialization 'Agrifood development economics and management'	Montpellier SupAgro, UM1
		Mankind, landscape, territories - Specialization 'Combined landscape and territorial dynamics'	UPVD
		Territories and societies, planning and development - Specialization 'Innovation and rural territorial development'	CIHEAM/IAM.M, Montpellier SupAgro / IRC,UM3
		Territories and societies, planning and development - Specialization 'Stakeholders, development and new territorialities'	UM3
Bac +6	<i>Ingénieur d'application (Applications Engineering)</i>	Engineering, tropical agriculture specialization - Option 'Economics of public policies, organizations and agricultural markets' (ECODEV)	Montpellier SupAgro/ IRC
		Engineering, tropical agriculture specialization - Option 'Development of production, markets, organizations, quality'	Montpellier SupAgro/ IRC
		Engineering, tropical agriculture specialization - Option 'Social water management'	Montpellier SupAgro/ IRC
	<i>Mastère spécialisé (Specialized MSc)</i>	Tropical agricultural development (DAT) – Option 'Economics of public policies, organizations and agricultural markets'	Montpellier SupAgro/ IRC
		Tropical agricultural development (DAT) - Option 'Development of production, markets, organizations, quality'	Montpellier SupAgro/ IRC
Bac +8	<i>Doctorat (PhD)</i>	Law and social sciences - ED 461 DSS	UM1
		Economy and management - ED 231 EDEG	Montpellier SupAgro, UM1, UM2
		Territory, time, societies and development - ED 60 TTSD	UM3, UPVD

Training-education programmes specialized on other themes with the main components focused on the Societies and Sustainable Development theme

Level	Degree	Title	Institution
Bac +3	<i>Licence</i> (BSc)	Geography and planning	UPVD
		Geography and planning	UM3
		Economic science	UM1
		Management science	UM1
	<i>Licence professionnelle</i> (BSc with professional scope)	Environmental preservation - Specialization 'Agricultural management of natural rural areas'	EPLEA Lozère, Montpellier SupAgro, UM3
Bac +4	<i>Diplôme d'Université</i> (University diploma)	Rural law and agricultural enterprises	UM1
Bac +5	<i>Ingénieur</i> (Engineering)	ISTOM Engineering – International agrodevelopment	ISTOM
	<i>Master professionnelle</i> (Professional MSc)	Agriculture, agronomy and agrifood science - Specialization 'Tropical farming systems and development management'	Montpellier SupAgro / IRC
		Agriculture, agronomy and agrifood science - Specialization 'Innovative systems and techniques for sustainable agricultural development'	Montpellier SupAgro
		Agriculture, agronomy and agrifood science - Specialization 'Environmental management of tropical ecosystems and forests'	AgroParisTech/ ENGREF, Montpellier SupAgro
		Biology, geosciences, agrosources, environment – Category 'Management of coastal and offshore oceanic areas'	UM1, UM2, UM3
		Biology, geosciences, agrosources, environment - Category 'Integrated territorial development and planning'	UM2
		Environment - risk - Specialization 'Management of coastal and offshore oceanic areas'	UM1, UM2, UM3
		Environment - risk - Specialization 'Risk science'	UM1, UM2, UM3, EMA
		Political science - Specialization 'Cooperation agents and international solidarity'	UM1
		Territories and societies, planning and development - Specialization 'Management of coastal and offshore oceanic areas'	UM1, UM2, UM3
Bac +6	<i>Ingénieur d'application</i> (Applications Engineering)	Engineering, tropical agriculture specialization - Option 'Agriculture and innovations in rural environments'	Montpellier SupAgro / IRC
	<i>Master spécialisé</i> (Specialized MSc)	Tropical environmental development - Option 'Social water management'	Montpellier SupAgro / IRC
		Local information systems and territorial planning	AgroParisTech/ ENGREF, Montpellier SupAgro
		Management of life and agrifood enterprises	Montpellier SupAgro/ EM Lyon
		Tropical agricultural development - Option 'Agriculture and innovations in rural environments'	Montpellier SupAgro / IRC

Short training-education programmes

Short training modules

Institution	Title
CIRAD	Wildlife and development (2 weeks)
	Pastoralism: societies and territories (2 weeks)
CIHEAM / IAM.M	Economics of rural development (1 week)
	Predagnosis of a rural area and data analysis (2 weeks)
	Diagnostic analysis of a rural area (4 weeks)
	Analysis of food systems (3 weeks)

Institution	Title
CIHEAM / IAM.M	Analysis of agrifood subsectors (1 week)
	Government, public choices and food security (1 week)
	Markets, policies and international bargaining (4 weeks)
	Water issues and challenges (2 weeks)
	Water and environment policies (2 weeks)
	Integrated resource management (2 weeks)
	Societies, stakeholders and rural territories (2 weeks)
	Mediterranean agricultures (2 weeks)
	Sustainable development indicators (2 weeks)
	Operational planning and rural development (2 weeks)
	Sustainable development and rural development (2 weeks)
	Financial assessment (4 weeks)
	Economic assessment (4 weeks)
	Farm enterprise management (4 weeks)
	Modelling and decision support (4 weeks)
	Stakeholders and resource management (4 weeks)
	Globalization and food geostrategies (4 weeks)
	Marketing and world trade (4 weeks)
	Distribution management (4 weeks)
	Modelling and agricultural policies (4 weeks)
	Food policies (4 weeks)
	Public policies and international relations (4 weeks)
Montpellier SupAgro / IRC	Understanding family agriculture: systems approach (4 weeks)
	Stakeholder strategies and development strategies (4 weeks)
	Technical changes and social dynamics: roles and functions of extension agents (4 weeks)
	Conducting comprehensive surveys and processing the results for development initiatives (4 weeks)
	Management instruments (3 weeks)
	Societies, territories and natural resource management in Mediterranean areas (4 weeks)
	Land issues in developing countries: specificities, political issues and regulation (4 weeks)
	Rural development project assessment: concepts and methods (2 weeks)
	Rural development project assessment: monitoring-assessment of a local development initiative (2 weeks)
	Markets, policies and international bargaining (4 weeks)
	Multi-stakeholder approach and local natural resource management (4 weeks)
	Heritage approach to natural resources and mediation (1 week)
	Environmental impact assessment: methods and tools (1 week)
	Local development dynamics and planning (4 weeks)
	Water policies and environment management (4 weeks)
	Social water management: analysis of an irrigated system (4 weeks)
	Farmers' organizations (4 weeks)
	Farm counselling and decision support (4 weeks)
	Social construction of farmer training demand (3 weeks)
	Microfinance to benefit the rural community (4 weeks)
	Rural finance instruments (4 weeks)
	Agricultural funding and farmers' organizations (4 weeks)

Agropolis International training and education

PhD institutions working on the Societies and Sustainable Development theme

A PhD diploma is obtained after 3 years of laboratory research. PhD students are de facto attached to a PhD institution. PhD institutions host research units and laboratories working on major themes. Their mission is twofold: 1) to ensure direct scientific support for PhD students; 2) to provide additional training throughout the 3 years. The purpose of these modules is to improve the scientific education of the PhD students and help them prepare their professional future.

Three PhD schools focus on the 'Societies and Sustainable Development' theme:

PhD school

'Droit et sciences sociales'

The PhD school *'Droit et Sciences sociales'* (law and social sciences) offers PhD level training and education: conferences and seminars on themes such as law theory, the philosophy of law, history, etc., updating seminars on positive law topics (contract law, corporate law, penal law, administrative law, etc.), an important rhetorical seminar combined with a court pleading competition based on a mock trial of a historical figure, a PhD week involving meetings with legal professionals, and finally 'PhD school workshops' (where PhD candidates present their research). In its regional scope, the PhD school *'Droit et Sciences sociales'*:

- offers professional training to PhD candidates
- organizes professional meetings
- provides openings in disciplines related to law theory.

PhD school

'Économie et gestion'

The Montpellier PhD school *'Économie et gestion'* (economy and management) is attached to UM1, but also groups the main public higher education institutions in Montpellier involved in economics and management sciences, i.e. UM1, UM2 and Montpellier SupAgro. It

consists of six nationally accredited research teams: two UMRs (LAMETA and MOISA) and four university host teams (ERFI, LASER, CREGOR, CR2M). Social science researchers from two other UMRs (INNOVATION, G-EAU) are also associated with the school. Overall, there are almost 170 senior scientists on these teams, 80 of whom are accredited research directors, supervising around 200 PhD students.

PhD school

'Territoire, temps, sociétés, développement'

The PhD school *'Territoire, temps, société, développement'* (territory, time, society, development) groups a total of 19 teams, 13 of which are from UM3 specialized in social sciences. It also includes researchers from the *École d'architecture de Montpellier* and the *Institut de Théologie Protestante de Montpellier* (sociology of religions). Two UPVD teams are also associated with this PhD school. Thirteen disciplines are represented: management, anthropology, archaeology, ecology, ethnology, geography, modern and contemporary history, psychology, economic science, educational science, management science, information and communication science, and sociology. Overall, there are 300 researchers or teacher-researchers, 140 of whom are accredited, or deemed to be, research directors, with a total of 500 PhD students. ■

Contacts

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www.univ-montp1.fr/recherche/ecoles_doctorales/ecole_doctorale_droit_et_sciences_sociales

PhD school *'Économie et gestion'* (ED 231 EDEG)

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PhD school *'Territoire, temps, sociétés, développement'* (ED 60 TTSD) (UM3, UPVD)

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1. Cravirola farm, near Minerve (Aude region, France).
2. Solongo farm (Pardailhan), combining horse rearing, horseback riding and wilderness camping.
3. A valley in the Cathar region.
4. Cherry trees in Fontfroide Valley (Aude region, France).

Training on rural multiactivity companies



This multiactivity training/support initiative is offered by UMR TETIS and GRETA in Bédarieux (Hérault region, France). This full-scale experiment is carried out within the framework of a research project on tailoring support initiatives to multiactivity and territorial needs.

It is funded by Languedoc-Roussillon region (France) under its 'Expérimentation/Recherche/Innovation' programme. The aim is to facilitate the creation and development of territorially integrated rural multiactivity initiatives.

Fourteen trainees are hosted. Half of the 13 projects (one project involves two trainees) are agriculturally based, and the

other fields involved are mainly linked with tourism, services and art crafts. Each project leader, can, depending on the progress of his/her project, realign or reframe his/her activity if the constraints become overwhelming (or, conversely, shift to another multiactivity when one sector seems more suitable).

The first phase of the training (6 weeks) is focused on project formulation and write-up (from the concept to the project) so as to prepare the support, which is provided by territorial support structures, both individually and collectively. This will enable structures that currently provide sector-based support to work together and share their experience.

The second phase is focused more on offering individual support to each project leader at their chosen pace, while also strengthening their skills and know-how.

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Contribution to the digital resources of the Environment and Sustainable Development Virtual University



© P.Y. Le Gal

Agriculture in South Africa

In 2007, the Environment and Sustainable Development Virtual University, or '*Université Virtuelle Environnement et Développement Durable*' (UVED) developed an unprecedented digital document that represents a relevant introduction to environment and sustainable development sciences. It was written by around 80 scientific specialists in this field from research organizations and French and international higher educational institutions. The BSc-level contents are accessible to students and any informed people interested in these fascinating complex fields. The aim is to provide students, teachers, researchers and citizens with an opportunity to discover and think about—in a reader-friendly way—complex processes, on different time scales, and the many driving forces (recently including humans) of changes in the Earth's biophysical environment. This document also offers websurfers an overview of the potential of 'new information and communication technologies' for mediating knowledge in these fields and for educational applications. From an academic standpoint, this digital document is meant to fulfil the needs of BSc students. CIRAD scientists contributed to the introductory module 'Mankind, societies, institutions, stakeholders of sustainable development', and especially the chapter 'Agriculture and sustainable development: a historical approach and prospects'.

Contact Sylvain Perret, sylvain.perret@cirad.fr

For further information: www.uved.fr

DEFIS (Development, expertise, training and engineering for developing countries)

The service DEFIS (development, expertise, training and engineering for developing countries, or '*Développement, expertise, formation et ingénierie pour le Sud*') is responsible for coordinating extended education, engineering training, expertise and university cooperation activities that make effective use—in a development cooperation framework—of knowledge acquired through educational courses and research initially provided by Montpellier SupAgro. The team is hosted at the Institut des régions chaudes (IRC) and works in close collaboration with teacher-researchers, students and trainees at this institution. The team implements a transversally-oriented systems approach. It is aimed at boosting the awareness of trainers, extension agents and researchers, and is also tapped to carry out studies (impact assessments, appraisals, diagnostic analyses, etc.).

Product quality, enterprise performance and subsector management are focuses of audit and support-consultancy engagements with enterprises and professional organizations in developing countries. DEFIS strives to fulfil the increasing demand for assistance in setting up and implementing diploma training on food quality and security.

In the training engineering field, the team has developed an original approach, called 'building stakeholder training demand', which involves integrating features from the systems approach, the sociology of practices and the economics of training. This approach is implemented in sub-Saharan African countries during the process of drawing up agricultural and rural training policies.

DEFIS is also devoted to promoting the professionalization of training and agricultural and agri-food training institutions. This is based on a new approach to the notion of skills and know-how of individuals and organizations.

In addition to training, DEFIS contributes to all services that provide support to the agricultural and agri-food community (microfinance, counselling, supporting farmers' organizations) by mobilising expertise developed within the framework of the 'Stakeholders and rural development' Master's programme.

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For further information:

<http://irc.supagro.inra.fr/ingenierie/defis-structure-162.html>



'Teraguas' computer role playing game—a tool to facilitate water management between many users in periurban areas in Brazil

R. Ducrot © CIRAD

List of acronyms *and abbreviations*

AgroParisTech/	Institut des sciences et industries du vivant et de l'environnement / <i>École Nationale du Génie Rural,</i>
ENGREF	<i>des Eaux et des Forêts (France)</i>
ANR	National Research Agency (France) / <i>Agence Nationale de la Recherche</i>
BRGM	Geoscience for a sustainable Earth (France) / <i>Géosciences pour une terre durable</i>
CAP	Common Agricultural Policy
CEMAGREF	Agricultural and environmental engineering research (France) / <i>La recherche pour l'ingénierie de l'agriculture et de l'environnement</i>
CIHEAM /	International Center for Advanced Mediterranean Agricultural Studies / Mediterranean
IAM.M	Agricultural Institute of Montpellier (France) / <i>Centre International des Hautes études Agronomiques Méditerranéennes / Institut Agronomique Méditerranéen de Montpellier</i>
CIRAD	Agricultural Research Centre for International Development (France) / <i>Centre de coopération internationale en recherche agronomique pour le développement</i>
CNRS	National Center for Scientific Research (France) / <i>Centre National de la Recherche Scientifique</i>
COM	<i>Collectivité d'outre-mer (France)</i>
CSE	<i>Centre de suivi écologique (Senegal)</i>
DOM-ROM	<i>Département d'outre-mer – Région d'outre-mer (France)</i>
ECOWAS	Economic Community of West African States
EHESP	<i>École des Hautes Études en Sciences Sociales (France)</i>
EM Lyon	EMLYON Business School / <i>École de Management de Lyon</i>
EMA	<i>École Nationale Supérieure des Techniques Industrielles des Mines d'Alès (France)</i>
ENEA	<i>École nationale d'économie appliquée (Senegal)</i>
ENPC	<i>École Nationale des Ponts et Chaussées (France)</i>
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FRE	<i>Formation de recherche en évolution</i>
IFAD	International Fund for Agricultural Development
IGAD	Intergovernmental Authority on Development
INRA	National Institute for Agricultural Research (France) / <i>Institut National de la Recherche Agronomique</i>
IPCC	Intergovernmental Panel on Climate Change
IRC	<i>Institut des Régions Chaudes (France)</i>
IRD	<i>Institut de Recherche pour le Développement (France)</i>
ISRA	<i>Institut sénégalais de recherches agricoles (Senegal)</i>
ISTOM	<i>Institut d'Agro Développement International (France)</i>
LEAD	Livestock, Environment and Development
MAEE	French Ministry for European and Foreign Affairs / <i>Ministère des Affaires étrangères et européennes</i>
MAP	French Ministry for Agriculture and Fisheries / <i>Ministère de l'Agriculture et de la Pêche</i>
Montpellier SupAgro	<i>Centre international d'études supérieures en sciences agronomiques (France)</i>
NGO	Non-governmental organization
OECD	Organisation for Economic Co-operation and Development
PICS	International Scientific Cooperation Projects / <i>Projet International de Coopération Scientifique</i>
R&D	Research and development
SEAPRISE	Social and Environmental Accountability of the Private Sector
SME	Small and medium-sized firms
UCAD	<i>Université Cheikh Anta Diop (Senegal)</i>
UICN	World Conservation Union / <i>Union Internationale pour la Conservation de la Nature</i>
UM1	<i>Université Montpellier 1 (France)</i>
UM2	<i>Université Montpellier 2 (France)</i>
UM3	<i>Université Montpellier 3 (France)</i>
UMR	Joint research unit / <i>Unité mixte de recherche</i>
UPR	Internal research unit / <i>Unité propre de recherche</i>
UPVD	<i>Université de Perpignan Via Domitia (France)</i>
UR	Research unit / <i>Unité de recherche</i>
URP	Cooperative research unit / <i>Unité de recherche en partenariat</i>
WTO	World Trade Organization

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International involved in this Dossier

AgroParisTech/ENGREF

BRGM

CEMAGREF

CIHEAM/IAM.M

CIRAD

CNRS

IDDR

INRA

IRD

Montpellier SupAgro

MSH-M

UM1

UM2

UM3

UPVD

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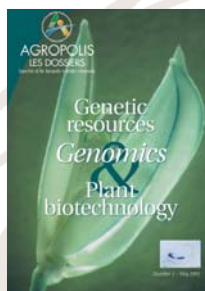
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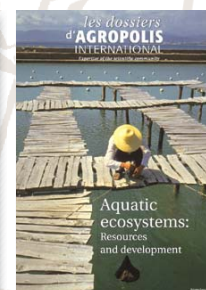
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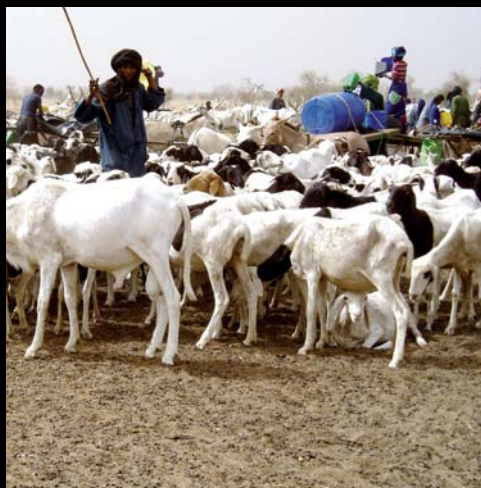
— Les dossiers d'Agropolis International —

The 'Dossiers d'Agropolis International' series is a deliverable of Agropolis International that is produced within the scope of its mission to promote expertise of the scientific community.

Each Dossier is devoted to a broad scientific theme, and includes a clear overview that is a ready reference for all laboratories and teams associated with Agropolis International that are conducting research on the target theme.

This series is meant to boost the awareness of our different partners on the expertise and potential available within our scientific community, but also to facilitate contacts for the development of scientific and technical cooperation and exchange.

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