

.....
AT THE HEART OF GLOBAL ISSUES
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cirad

AGRICULTURAL RESEARCH
FOR DEVELOPMENT

Biodiversity, a development factor

A challenge for CIRAD: to fulfil the future needs
of societies by placing biodiversity at the heart
of agriculture and production systems



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Working together for
tomorrow's agriculture

Food, energy, environment, health... challenges for world agriculture

Agricultural development is essential to meet the many challenges arising as a result of ongoing changes: food and energy security, environmental conservation...

The aim is not simply to produce, but also to sustainably manage all living organisms which, via their diversity, supply most goods and services that are essential for the existence and wellbeing of humankind.

Biodiversity is the source of all agricultural production, but modern intensive agriculture has streamlined practices, products and landscapes.

Enhancing the sustainability of agricultural systems, reassessing production strategies, broadening the range of crop species and varieties and rethinking landscape organization are the challenges facing an alternative type of ecologically-oriented agricultural intensification.

Farmers' know-how and innovation capacities are essential for devising sustainable production strategies to address future needs.

Putting biodiversity management back on the agricultural research agenda

> Biodiversity and production

Agricultural research must take all living organisms and their interactions in landscapes into account to design sustainable production systems tailored to peoples' needs. CIRAD, in collaboration with its partners, is focusing on:

- Diversifying agricultural objectives: food production, environmental, adaptive, etc.
- Integrating local production and know-how and supporting technical and social innovations
- Adapting key species such as rice, sorghum and eucalyptus to climatic changes
- Understanding and making use of species-ecosystem interactions to enhance risk management
- Managing relevant germplasm collections, *ex situ* and *in situ*

> Biodiversity, regulation, transformation and resilience

In a changing environment, it is essential to gain greater insight into the regulating effects of biodiversity if we are to support rural societies in their adaptation and transformation of biological, technical and social systems. CIRAD's research aims to:

- Understand the role of genetic and species diversity in the regulation of agricultural systems
- Account for different spatiotemporal scales related to changes, disturbances, breakdowns, etc.
- Assess the effects of different biodiversity management strategies in biological, technical and social areas

> Biodiversity and equality

CIRAD and its partners study the conditions in which biodiversity conservation, restoration and use could contribute to fighting poverty.

This involves investigating how to:

- Make more effective use of know-how, genetic resources and services provided by biodiversity
- Manage the transition from degraded systems to more biodiversified systems
- Integrate biodiversity in policies to reduce inequality
- Support collective institutions and management practices affecting biodiversity

> Biodiversity, food processing and nutrition

Using local varieties and species of fruit, vegetables and microorganisms can overcome nutritional imbalances and help combat malnutrition above and beyond the basic caloric intake.

CIRAD's research on sustainable food systems aims to:

- Analyse, promote and preserve the nutritional, organoleptic and functional properties of local resources and produce
- Improve the nutritional quality of foods, especially via fermentation processes using the local microbial diversity

Ecosystem services and use of rural areas

SERENA (ANR, 2009-2012)

France, USA, Costa Rica, Madagascar

The aim of this project is to identify public action principles, mechanisms and arrangements that facilitate effective consideration of the ecosystem service concept in policy-making. This concept includes the productive function of ecosystems, as well as regulation, cultural and heritage functions.

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Agroforestry for food security

AFS4Food (African Union, EuropeAid, 2012-2015)

Cameroon, Kenya, Madagascar

This project seeks to enhance food security and wellbeing of rural African households via agroforestry. Adopting this agroecological production strategy improves synergy between food crops and commercial crops. In addition to assessing the performance of agroforestry systems in three countries, this project ensures networking between all partners.

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Promoting the diversity of roots, tubers and bananas

CRP RTB, Theme 6 (CGIAR, 2012-...)

Worldwide

This theme is focused on assessing the diversity of roots, tubers and bananas to enhance their characteristics relative to consumer and user preferences. The aim is also to develop sustainable production techniques and postharvest technologies that will improve living conditions for smallholders and processing operators.

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Sustainable management of agricultural biodiversity

(FFEM1 et 2, 2002-2013)

Mali, Burkina Faso

The aim is to develop sound management of agricultural biodiversity in order to strengthen production system sustainability. A broad range of new high-yielding sorghum varieties adapted to local climatic conditions and farmers' needs and preferences has been developed.

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Forest biodiversity dynamics

CoForTips (ERA-Net, Biodiversa, 2013-2015)

Congo Basin

The purpose of this project is to gain further insight into the dynamics, identify tipping points in biodiversity conservation and the resilience of social ecological systems in forests of the Congo Basin. It also aims to construct, on different spatiotemporal scales, scenarios of these dynamics that could be used as decision-support tools.

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Agroecological management of horticultural systems

Devag (European Union, 2009-2013)

Caribbean

This project seeks to develop agroecological horticultural systems, which are essential to ensure a healthy diet, food self-sufficiency and a source of income for Caribbean inhabitants. Pests and parasites are controlled by optimizing the use of local resources and their exchange among islands, and using a combination of genetic resistance and sanitizing plants.

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Production and conservation in partnership

EU-PARSEL (European Union, 2008-2011)

South Africa and Zambezi Valley

The aim of this project is to develop partnerships between public and private communities to promote sustainable development: operational small-scale irrigation schemes, improved management of natural resources and crop production, legal venison supply, improved herd management and livestock production and market opportunity development.

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<http://www.rp-pcp.org/projects/completed/eu-parsel>



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Excellent and wide-ranging outputs

> **CIRAD** has close relations with international organizations such as the **Convention on Biological Diversity (CBD)**, the **FAO Commission on Genetic Resources, CGIAR, CATIE**, etc.

> CIRAD is a founding member of the **Fondation française pour la recherche sur la biodiversité (FRB)**, **Alliance pour l'environnement (AllEnvi)** and the **Global Horticultural Initiative (GlobalHort)**.

> CIRAD offers many **professional training and degree courses**: it is involved particularly in the **PARC Masters, Production animale en régions chaudes**, and the **EPSED Masters, Elevage des Pays du Sud - Environnement et Développement**, and in the **Ecole thématique internationale** Agro-biodiversité, Morocco; it contributes to the organization of research seminars: Agroecology; Functional traits and design of multi-species cropping systems (Martinique); Genomic management of livestock genetic resources in hot regions (Guadeloupe).

> CIRAD publishes impact factor journals: *Fruits* and *Bois et Forêts des Tropiques*.

> **CIRAD researchers** co-organize **international conferences**, such as the *Resilience 2014* conference (5-9 May 2014, Montpellier, France), the first *International Conference on Organic Rice*

Farming and Production Systems (27-30 August 2012, Montpellier, France), the *Rio+20, Agro-science takes up the challenge* round table (21 June 2012, Rio de Janeiro, Brazil) and the *Biodiversity Information Standards (TDWG)* annual conference (09-13 November 2009, Montpellier, France).

> They are involved in **national and international expertise networks** ranging from tropical crop germplasm research, such as the *Rice Functional Genomics platform* (Refuge), in Montpellier (France), to **farmers' organizations**, such as the *Réseaux des producteurs innovateurs au Burkina Faso (AMSP)* and the *NGO Association malienne d'éveil au développement durable (AMEDD)*, in partnership with national and regional research institutions.

> They publish papers on this topic in over **20 reference journals**, in areas ranging from social sciences, ecology, environment, agroforestry, genetics, modelling, prospective studies, etc.

> They publish books such as: *Cultiver la biodiversité pour transformer l'agriculture* (E. Hainzelin et al., 2013); *Transfrontier Conservation Areas* (J. A. Andersson et al., 2012); *Crop Genetic Resources as a Global Common: challenges in international law and governance* (M. Halewood et al., 2013); *Under-utilized Fruits in Africa* (*Fruits*, special issue, 2013).

> CIRAD's BIODIVERSITY RESEARCH in numbers:

50 years' experience

250 researchers

20 research units and affiliated research units

20% publications

50 countries involved in the research

30 regional projects in partnership

5 biological resource centres (Réunion, Montpellier, French Guiana, Guadeloupe, Martinique) in collaboration with INRA and IRD

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Platforms for partnership for research and training

