

# Biodiversity and development



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## Context and issues

In today's world, some 2.6 billion people produce more than 70% of the world's food on more than **Food, energy, environment, health...** Agricultural development is essential to meet the many challenges arising as a result of ongoing changes: food and energy security, environmental conservation...

### Biodiversity, a development factor

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.

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

## What's CIRAD doing?

CIRAD works to improve living conditions for the world's poorest people. With its global network of partners, it generates new knowledge, supports agricultural development and helps address the major agricultural and food issues. Sustainable management of agricultural biodiversity is an intergral part of its mandate.

### 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 speciesecosystem 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

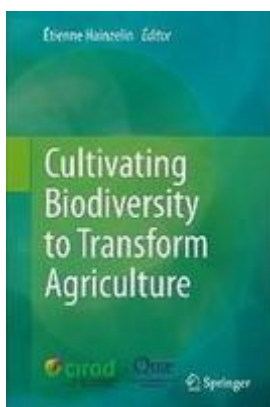


Using local varieties and species of fruit, vegetables and microorganisms can overcome nutritional imbalances and help combat malnutrition above and beyond the basic caloric intake. CIRAD's research on sustainable food systems aims to:

- 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

## Resources

### Books and documents



- *Innovation et développement dans les systèmes agricoles et alimentaires*, Faure G., Chiffolleau Y., Goulet F., Temple L., Touzard J.M. (éd.). Quæ, 2018, 259 p.
- *Biodiversity conservation in Southeast Asia: challenges in a changing environment*, Morand S., Lajaunie C., Satrawaha R. (éd.). Routledge, 2018, 315 p.
- *Biodiversity and health: Linking life, ecosystems and societies*, Morand S., Lajaunie C. (éd.). ISTE, 2018, 300 p.
- *Cultivating biodiversity to transform agriculture*, E. Hainzelin (ed.), Springer 2014.
- *La biodiversité, facteur de développement*. Cirad, 2013. (PDF - 1,11 Mo)

### Scientific websites

- [Scientific websites on biodiversity](#)

### Science for all

- [Resources for the general public](#) (Reports, brochures, etc.)

## Collections, platforms

As part of its research activities and national and international partnerships, CIRAD manages more than a hundred genetic resource collections. In all, these unique collections contain more than 135 000 genotypes of some 500 species. CIRAD also holds herbariums, and is a contributor to several collective research platforms and tools intended to analyse and disseminate those genetic resources in line with the relevant regulations. It shares its collections within international networks.

### Biological resource centres (BRCs) and associated platforms

- Florilège, The agro-biodiversity in France: the main agricultural genetic resources held in France.
- Tropical Biological Resource Centre, Montpellier: management and dissemination of tropical plant resources
- Tropical Plant Biological Resource Centre, Guadeloupe, Martinique: pineapple, banana, sugarcane, fruits trees and yam.
- Perennial Crop Biological Resource Centre, French Guiana: coffee, cocoa, rubber
- Animal health Biological Resource Centre, Guadeloupe: a collection built up over more than 20 years' work and partnerships, particularly with countries in the Caribbean, Africa and the Indian Ocean
- Vatel Biological Resource Centre, Réunion: management and dissemination of tropical plant resources
- Visacane, sugarcane quarantine, Montpellier: disease detection/diagnosis, eradication, plant material transfers

### In situ experimentation

- Réunion : plant protection platform (3P); Cyclotron Réunion Océan Indien platform (animal health and biodiversity)
- French West Indies-French Guiana : banana varietal breeding platform, Guadeloupe
- Forestry platforms at Paracou and Combi, French Guiana

### Other collective research tools

- Collaborative platform to support strategy-building for the study and conservation of biodiversity (OpenAlea) - Montpellier: representation, analysis and modelling of plant functioning and architecture development
- Molecular biology and biotechnology, phenotyping : see the other collective research tools

### Herbariums

- CIRAD African plant herbarium (under the Pl@ntnet project)

### Species databases

- Trees and shrubs of the forests of Réunion
- Plants of the rice field of French Guiana
- Fruits of the West Indies (Caribfruits)

- Plants of the rice fields of Camargue
- Tropical weeds

## Genetic databases

- Tropgene database is the base that manages genetic and genomic data on the tropical plants studies by CIRAD. The base is split into plant-specific modules