

AT THE HEART OF GLOBAL ISSUES



cirad

AGRICULTURAL RESEARCH
FOR DEVELOPMENT

> Innovative
agriculture
in response
to
climate
change

A phenomenon which strongly affects poor farmers in tropical regions

The humid tropics are likely to become even wetter and dry regions even drier. These regions of the world are also areas of concentrated poverty and are therefore particularly vulnerable.

Knowledge about the future climate of tropical and Mediterranean regions must be strengthened

Indeed, the models developed to anticipate future changes are, above all, adapted for industrial crops in temperate zones...

Agriculture must adapt to climate change and contribute to its mitigation

Adaptation is a priority in tropical and Mediterranean regions. Whether it be agriculture or changes in land use, the mitigation of greenhouse gas emissions is a major issue.

It is important to combine public policies, financing and innovative practices

By taking into account food security and climate change, appropriate responses combining public policies, funding and innovative agricultural practices will be designed to improve the resilience of rural societies. From local to global, all levels of decision-making are concerned.

Research and innovations built on local needs

> Adapting to new constraints

Seasonal irregularities, excess heat, soil salinisation and water shortages disrupt crop cycles and ecosystems. Production losses have an impact on the standard of living and food security of rural societies. CIRAD and its partners are conducting research to:

- Understand the vulnerability of farms faced with disruptions such as water shortages or climatic irregularities.
- Evaluate and improve resilience to risks, through the design of innovative cropping systems adapted to local conditions and by supporting the development of appropriate policies.
- Build knowledge bases on the response of agroecosystems and practices to climate constraints.
- Develop approaches to minimising risks (water management, biodiversity, associations of different crops, integration of crops and livestock etc.).
- Breed varieties tolerant to new weather patterns or extreme weather episodes (rice, cotton, groundnut, coffee etc.).

> Developing a 'One Health' approach

The spread of both animal and plant diseases and their vectors is increasing health risks in most parts of the world. With national and international organisations, CIRAD's approach is to:

- Conduct experimental and epidemiological studies.
- Model and simulate disease transmission under different environmental conditions.
- Promote natural regulation of crop pests and develop agroecology.
- Develop control methods targeted at the vectors of animal diseases.
- Strengthen regional monitoring and control networks, combining human and veterinary health services.

> Mitigating greenhouse gas emissions

Designing cropping and livestock systems, farms, territories and landscapes which are 'carbon rich' is contributing to the development of 'climate smart' agriculture. For example:

- Designing high environmental efficiency in livestock production systems.
- Enhancing the role of planted forests or perennial crops in mitigating emissions.
- Rethinking local energy production to reduce the use of fossil carbon.
- Developing new sources of bioenergy: dedicated plantations, agricultural residues, multi-purpose plants.
- Improving the recycling of agricultural by-products.
- Designing associations in agroforestry (trees and crops) or in conservation agriculture (crops and cover crops) which enhance carbon storage.

> Supporting public policies

Public action should support the role of 'climate smart' agriculture for food security. In particular, research contributes to:

- Understanding the relationship between climate change, urbanisation, industrialisation of agricultural and food sectors and new nutritional diseases (malnutrition, obesity etc.).
- Promoting and enhancing ecosystem services which have a positive influence on greenhouse gas emissions (notably through payments for environmental services).
- Developing territories and promoting their multifunctionality, with a particular focus on land use policies.
- Improving health policies (assessment, prioritisation and risk reduction) in the context of 'One Health'.
- Integrating standards and certifications in production strategies, notably through life cycle analyses.
- Analysing the international debates on climate change negotiations, their contributions and incorporating them into research programming.



TmFO. Tropical managed Forest Observatory.

CGIAR, 2009-...

The Tropical managed Forest Observatory is financed by CGIAR's Sentinel Landscape programme. Its main objective is to evaluate the resilience of logged tropical forests in the face of climate change and their capacity to produce goods and services in a sustainable manner.

<http://www.tmfo.org>

AFS4Food. Improved synergy between agroforestry systems and food crops.

European Commission, 2012-2015

Agroforestry systems based on perennial crops can contribute to improving the food security and well-being of African farmers. Three countries are sharing their experience of these systems: based on cocoa in Cameroon, coffee in Kenya and clove in Madagascar.

<http://afs4food.cirad.fr>

IntensAfrica, a shared initiative between Europe and Africa.

European Union-FARA-NEPAD, 2015-...

Sustainable intensification, agroecology, a new green revolution... there is no unique model for adapting African agriculture to changes. This project will build the scientific basis for evaluating these models.

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Climed. The future of Mediterranean livestock farming systems: opportunity and efficiency of crops-livestock integration. ANR, 2012-2015

The challenge is to help producers, local communities and policy makers to set priorities and to put in place appropriate techniques and policies taking into account demographic pressure, growing demand and strong international competition.

<http://climed.cirad.fr>

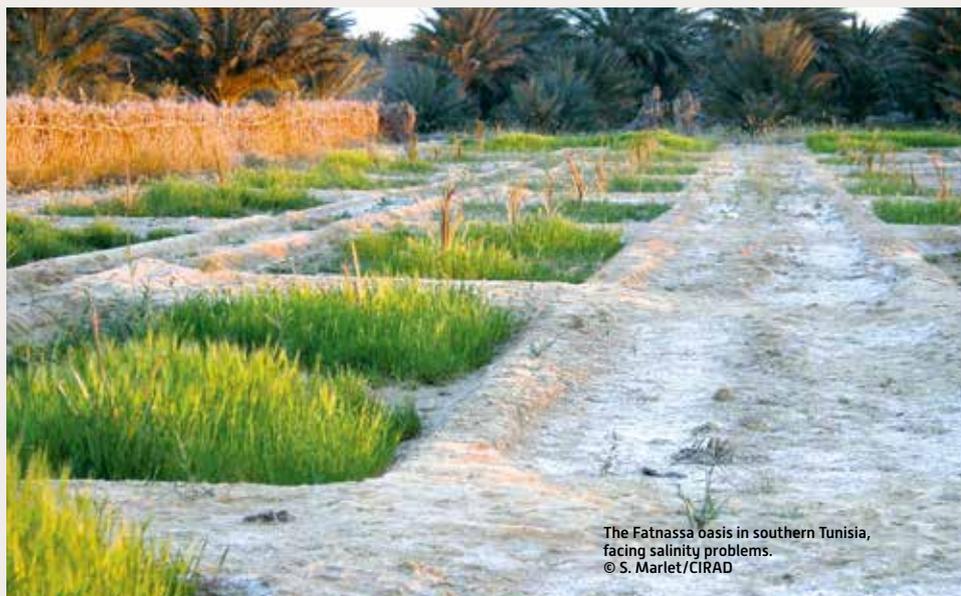


Association of cocoa and coconut trees. © D. Snoeck/CIRAD

Pesmix. Payments for environmental services: new panacea or useful auxiliary for environmental management? ANR, 2011-2014

Payments for environmental services (PSE) aim to improve the ecological integrity of ecosystems, to protect biodiversity and to alleviate poverty. This project evaluates the contribution of this instrument in environmental and agricultural policies and analyses the synergies and conflicts with other public and private actions.

<http://pesmix.cirad.fr>



The Fatnassa oasis in southern Tunisia, facing salinity problems. © S. Marlet/CIRAD

Groundwater-Arena. Governance of underground water resources in North Africa. ANR, 2012-2015

This project is analysing the vulnerability and adaptive capacity of irrigated agriculture based on groundwater, which has allowed a dynamic agricultural economy to develop but has many environmental consequences.

<http://www.groundwater-arena.net>

Agrimonde Terra. Land use and food (in)security. CIRAD-INRA, 2014-...

This foresight study explores how food security can be ensured towards the year 2050, taking into account possible changes in land use. It continues the work of Agrimonde (2006-2009)..

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Top-level, wide-ranging outputs

> **CIRAD** has close relations with international organisations such as the FAO (World Agriculture Watch), CGIAR (particularly in the CRP Climate Change, Agriculture and Food Security, CCAFS), WHO (especially for emerging vector-borne diseases and avian influenza) etc.

> It provides numerous vocational and degree courses in France and abroad.

> **Researchers** co-organise international conferences, such as the Resilience Congress 2014 (5-9 May, 2014, Montpellier) and the 3rd Global Science Conference on Climate Smart Agriculture, CSA 2015 (March 16-18, 2015, Montpellier).

> They are involved in national and international networks of expertise, ranging from research through to producer organisations, in partnership with national and regional research institutions.

> They publish collective works such as *Changement climatique et agricultures du monde* (E. Torquebiau, 2015, ed. Quae and Springer) and, in 2014, a review article: Leslie Lipper et al. Climate-smart agriculture for food security, *Nature Climate Change* 4, 1068-1072 (2014). DOI: 10.1038/nclimate2437.

CIRAD'S
CLIMATE CHANGE
RESEARCH IS



An essential
or important issue for
21 research units
out of 34 and for
**21 research and training
platforms in partnership**
worldwide.

17% of publications

100 countries involved

50 regional projects
in partnership

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

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