

# ACTIVITIES REPORT 2018 HIGHLIGHTS



# CONTENTS

4 • STRATEGY  
AND GOVERNANCE

12 • PORTFOLIO

19 • SCIENTIFIC  
RESEARCH AS  
A DEVELOPMENT  
DRIVER

27 • EXPERTISE  
IN SUPPORT  
OF AGRICULTURAL  
VALUE CHAINS AND  
PUBLIC POLICY

35 • PARTNERSHIPS,  
A GUIDING PRINCIPLE  
FOR CIRAD

43 • FOCUS: AGROECOLOGY

47 • 2018 INDICATORS

54 • GENERAL  
ORGANIZATION  
AS OF 31 MAY 2019

**CIRAD is the French agricultural research and international cooperation organization working for the sustainable development of tropical and Mediterranean regions.**

Along with its partners, it is convinced that agriculture has a central role in the major transitions required to guarantee a sustainable future for every country in the global South.

Generating and sharing new knowledge, contributing to innovation processes and building the capacity and skills of stakeholders in those countries to support their sustainable development are the drivers of its operations.

In particular, its activities centre on issues such as biodiversity, the agroecological transition, climate change, health (of plants, animals and ecosystems), the development of rural territories, and food systems.

CIRAD works in some fifty countries on every continent, thanks to the expertise of its 1650 staff members, including 800 researchers, backed by a global network of partners.

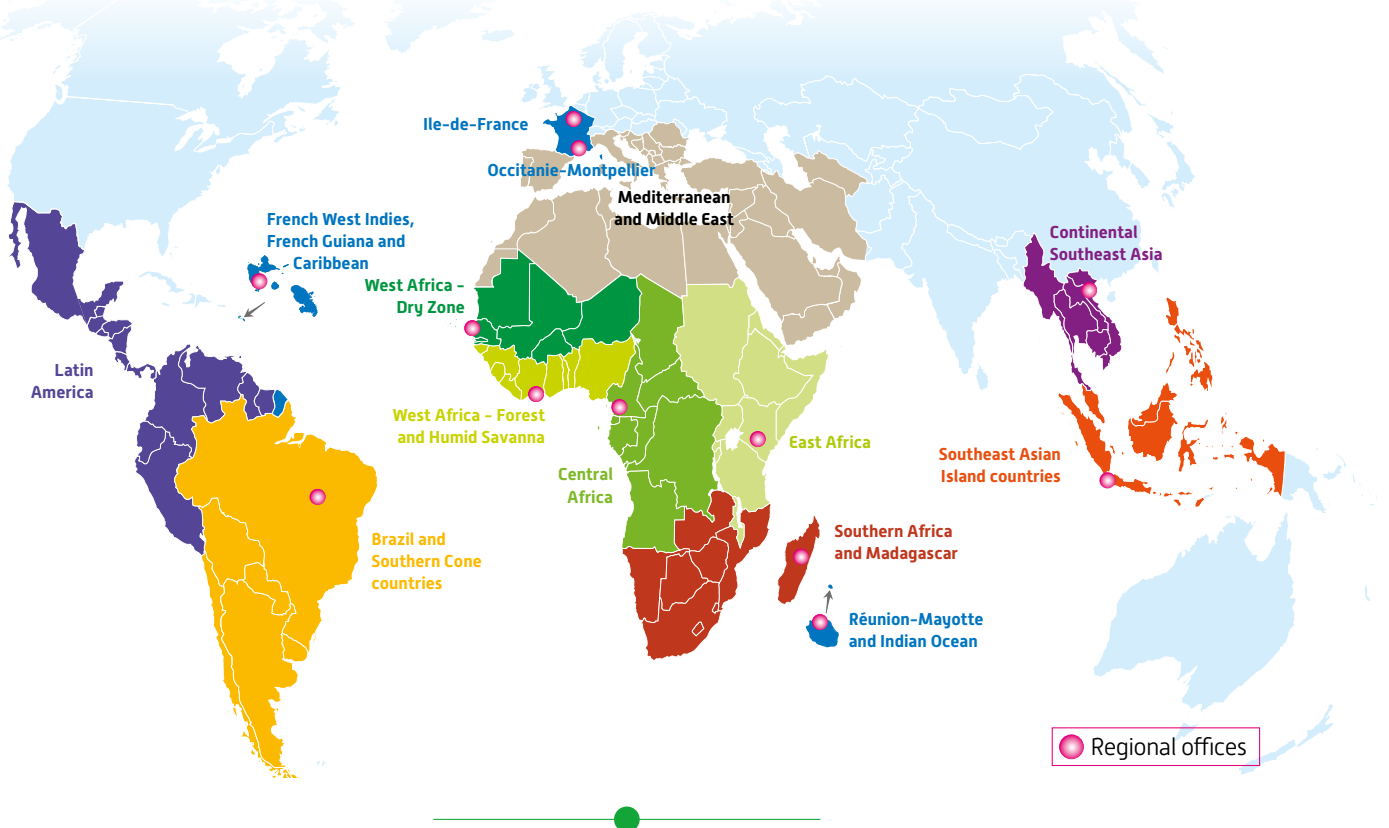
**1650**  
staff  
members

Budget of  
**200**  
million  
euros

**Leading  
research  
operator**  
in the French  
overseas regions

# CIRAD is present worldwide

Our Head Office is in Paris. Our research, reception and training centre is in Montpellier, at the heart of an international scientific hub. In the French overseas regions, CIRAD has laboratories, collections, technical platforms and experimental facilities that are the only ones of their kind in the world.



**Research** **839 scientific articles** published, including 455 with researchers from the global South

**22 platforms in partnership** for research and training worldwide

**800 researchers and technicians** from all over the world received each year

**Partnerships** **More than 300 researchers** on assignment overseas and in the French overseas regions

**18 000 days** of missions

Activities in more than **100 countries**, in partnership with **150 organizations**

**Training** **12 800 hours** of teaching provided

**400 PhD students** supervised, 57% of them from the global South

Partner in **120 higher education courses** (Masters to PhD), in France and overseas

# Addressing the current sustainable development issues



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Interview with CIRAD President  
Managing Director Michel Eddi:  
his take on 2018 and  
the prospects for 2019

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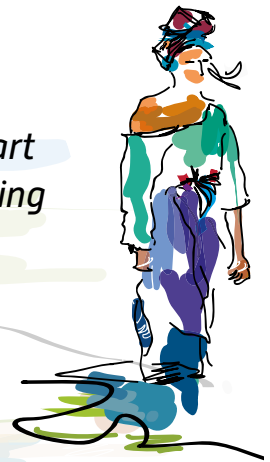


## **The international situation continued to change in 2018. What will this mean for CIRAD's remit?**

At a time when the planet is suffering the effects of global warming and food issues remain crucial in the light of ongoing population growth, particularly in Africa, where it is vital that resources and the environment be preserved, CIRAD's remit is more necessary than ever. We know that over and above a 2°C rise in temperature, the consequences could be disastrous for both people and farming, especially in Africa, the primary focus of our research and

actions. All at once, Africa faces challenges posed by demographic, climate, environmental, energy and food changes, while needing to alleviate poverty and create huge numbers of jobs in rural areas. CIRAD, with all its partners in the global South, is increasingly being called upon to help tackle all these challenges within a very short time frame. CIRAD's remit – research for sustainable development – is at the heart of the main global issues. Our mission, with its specific focus on farming systems and rural societies in the global South, is therefore more legitimate than ever.

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*CIRAD's remit – research for sustainable development – is at the heart of the main global issues. Our mission, with its specific focus on farming systems and rural societies in the global South, is therefore more legitimate than ever.*”



**With the new strategic vision drawn up for 2018–2028, CIRAD has laid the foundations for its scientific and partnership activities over the period 2019–2023. What are the broad outlines?**

The scientific and partnership strategy objectives (SPSO2), which were produced collectively, will be our guide and our roadmap for the coming five years. The document fills in the details of the four ambitions set by the strategic vision – science, partnerships, training, and lastly innovation and research impact – with a view to enabling CIRAD to fulfil its remit by adapting to the changing external framework into which its activities fit. To tackle the various challenges and make the best possible use of our expertise, we have chosen six key strategic fields within which our research will be conducted and through which CIRAD aims to become more visible and useful, by generating knowledge and solutions. The aim is to manage biodiversity better, whether natural or cultivated, and to adopt an integrated approach in addressing plant, animal and ecosystem health, agroecology, territories, food systems, and climate change. Moreover, three main areas of work fuel those ambitions: tropical value chains, gender and equality in the workplace, and software platforms.

**What about CIRAD's structure: has it changed?**

The knowledge generated by research is vitally important for tackling the vast challenges mentioned above and contributing to sustainable development in the global South. The year 2018 saw a rise in major global initiatives in favour of public development support policies centring on agriculture and the rural world, topics at the heart of our research. CIRAD has been very successful in answering calls for tender concerning large-scale projects, further proof of its capacity to design ambitious, multi-disciplinary projects. To support this dynamic, in January 2019, we set up a new Research Impact and Marketing Service ("DIMS"), attached to the Director General in charge of Research and Strategy. The service coordinates relations between decision-makers – policymakers or donors with research and development requirements – and CIRAD's scientific research units and departments, which lead its targeted research for development operations.

Once again, CIRAD has adapted to current issues and to its environment and is continuing to produce and share new knowledge, to contribute to innovation processes and to train stakeholders, hence supporting sustainable development in the global South. •

## 2019–2023 Scientific and Partnership Strategy Objectives

After drafting, in 2017, its strategic vision for the period 2018–2028, CIRAD went on to produce the corresponding scientific programming document: 2019–2023 Scientific and Partnership Strategy Objectives (SPSO<sub>2</sub>).



- > Considering biodiversity as a lever of development and resilience
- > Helping farming systems in the global South adapt to climate change
- > Developing an integrated plant, animal and ecosystem health approach
- > Supporting the transition to more sustainable, inclusive food systems
- > Considering territories as levers for sustainable, inclusive development
- > Developing agroecological transition engineering

- Greater consideration of gender issues in our research.
- The ongoing renewal of the "agricultural value chain" approach, which includes the sustainability issue.

### For our Partnerships ambition:

- Inclusive science, and partnerships continuing to expand into civil society and the private sector.

- More open platforms in partnership for research and training (dPs), forums for scientific production and leadership, project design and training associating groups of field partners.

- Increased collaboration by geographical basin and theme, including the French overseas regions.

- Affirmation of the regional and international vocation of our installations overseas.

### For our Training ambition:

- A "Training for the global South" objective centring on professional skill building.

- An approach focusing on a strategic analysis of demand from countries and institutions in the global South.

- Active cooperation backed by the clusters to which CIRAD belongs (I-Site MUSE and Agreenium).

- Greater collaboration with teaching establishments (universities, École Vétérinaire de Toulouse, Montpellier SupAgro) via a training project design platform.

### For our Innovation and Impact ambition:

- Concern for and a culture of impact at the heart of our projects and partnerships.

- Implementation by our researchers of the ImpresS *ex ante* impact assessment method, to integrate impact into our research operations.

- Scientific arguments intended for decision-makers and policymakers.

- Participatory practices that include stakeholders in the field, using tried and tested scientific approaches.

### For our resource policy:

- The creation of a Research Impact and Marketing Service ("DIMS").

- Implementation of an ambitious action plan in favour of equality in the workplace.

- Management support as a human resources policy priority.

- Genetic resource management practices geared towards our partners.

- Determined increased use of the latest digital knowledge management tools, to promote CIRAD's intangible knowledge and data heritage. ●

SPSO<sub>2</sub> follows on directly from the scientific and partnership strategy set out in SPSO<sub>1</sub>. However, it makes certain changes aimed at enabling CIRAD to fulfil its remit more effectively, by adapting to the changing external framework into which its activities fit.

The changes include:

### For our Science ambition:

- The translation of the 15 commitments made in the Strategic Vision into research operations, to form the overall framework into which the research units' operations will fit.

- **Six key strategic fields** renew the six priority lines of research set out in SPSO<sub>1</sub>, notably giving the topics of adaptation to climate change, biodiversity and territories greater importance.

# **icipe-CIRAD partnership.**

## **Dr Segenet Kelemu's perspective**

**Dr Segenet Kelemu is the Director General and CEO of the International Centre of Insect Physiology and Ecology (*icipe*) in Nairobi, Kenya. She is a 2014 Laureate of the L'Oréal-UNESCO for Women in Science Awards, and one of the top 100 most influential African women featured in the May 2014 Edition of *Forbes Africa*. Segenet Kelemu was listed among the ten most influential African women in agriculture by the *Journal of Gender, Agriculture and Food Security*.**

### **Could you describe *icipe*'s research activities in a few words?**

*icipe* is highly focused, reflecting the myriad substantial challenges that insects and related arthropods pose for Africa and the tropics in general. *icipe*'s mission to improve health, food and nutrition security as well as environmental sustainability tallies with the SDGs and the development priorities of sub-Saharan African countries, including the peace, industrial competitiveness and prosperity goals of the African Union Agenda 2063. More specifically, *icipe* is a partner in development through scientific capacity building and knowledge generation, innovation and policy support, with national governments and regional economic communities.

With more than 600 staff, 180 graduate students each year, more than 300 partner organizations, including 43 African universities, and operations in 41 African countries, *icipe* is one of the main agricultural and biological research institutes in Africa.

### **What do you see as the benefits of the cooperation between CIRAD and *icipe*?**

*icipe* and CIRAD have a longstanding partnership and agreement, a mutual vision and goal of contributing to science for development in Africa.

What makes their partnership stand out is that in line with the agreed agenda, CIRAD scientists are integrated into *icipe* programmes and they work alongside *icipe* scientists to contribute to African development.



© Julian Dufort

### **How do you think integrating CIRAD scientists as *icipe* staff differs from other types of cooperation?**

The difference between other partnerships and the CIRAD-*icipe* partnership is that with CIRAD, we have mutual agreements, mutual goals and a common vision of common interest: basically, research for development. CIRAD scientists based at *icipe* abide by *icipe*'s policies and regulations and they do research and also contribute substantially to supervision of students from across Africa, through our major capacity-building programme.

First and foremost, they contribute to nurturing the next generation of African scientists – comprising PhD and Masters graduate students – to generating high

quality research and publications, and to adapting the research structure for future impact, making sure that its output is actually reaching the end user, to improve the current system and the environment.

### **Do you have any success stories to quote in terms of high-level publications or project stories based on our work cooperation?**

There are many good outputs and success stories and I think the one I would like to highlight is the work on coffee: in designing a specific trap for *Antestia* bugs to manage their populations and reduce their impact on coffee production in a bio-control (non-chemical) way. This is one of the major outputs and we are hopeful that some good products will come out of this.

### **Based on our past cooperation, how do you see our common future, or which area of cooperation you would like to reinforce between our two institutions in the coming years?**

The cooperation between *icipe* and CIRAD has been productive and successful and, hopefully, we can expand this partnership by including other areas of research. All the CIRAD scientists are currently in the "plant health" unit. We would like to see CIRAD give *icipe* more skills and expertise in the "animal health" unit, for example in tsetse fly control and tick diseases in animals.

We are also keen to contribute to research on bee health since this is a major global issue. There are therefore a lot of key strategic areas of cooperation which are important to both institutions. ●

## RENEWED GOVERNANCE

**CIRAD renewed its governance bodies in 2018, with four new members appointed to its management board and a new Chair of its Science Council.**



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Left to right: Sylvain Perret, Élisabeth Claverie de Saint-Martin, Jean-Paul Laclau and Thierry Lefrançois.



## Three questions for..

### **Élisabeth Claverie de Saint-Martin, new Director General in charge of Research and Strategy**

Élisabeth Claverie, a development policy strategist, joined CIRAD on 5 March 2018. She was formerly Deputy Head of Development at the French Ministry for Europe and Foreign Affairs, and as such, was on our Board of Trustees.

#### **What added value does your past experience bring to CIRAD?**

I have in-depth knowledge of the institutions in France, Europe (notably the EU) and worldwide (such as the World Bank, where I worked) tasked with promoting sustainable development, particularly of countries in the global South. I am also familiar with the political bodies within which strategic talks are held between States and operators in charge of designing and funding major development support programmes

#### **What is your main responsibility?**

In the current context of change at CIRAD, aimed at adapting its scientific operations to the new political framework and renewing its economic model, I am in charge of overseeing the deployment of the new strategic vision for our research and partnerships.

#### **What is CIRAD's main asset in terms of its remit of agricultural research for development in the global South?**

CIRAD has forged a wide range of strong, longstanding links with partners in the global South. This anchorage in the territories concerned and the quality of the dialogue established between our researchers and their partners in those areas are our most valuable assets. Our commitment to partnerships, impact and sustainability, combined with our strong scientific ambitions, will allow us to contribute to building an agricultural sector capable of driving development in the global South and of innovating in response to the challenges set by climate change and biodiversity protection. ●

### **Thierry Lefrançois, new Director of CIRAD's Biological Systems Department (Bios)**

On 1 September 2018, Thierry Lefrançois joined the CIRAD management board as Director of its BIOS department, after heading the Animals, Health, Territories, Risks and Ecosystems joint research unit (UMR AStre).

#### **What added value does your past experience bring to CIRAD?**

I bring with me my experience of managing a multi-disciplinary research unit working on health, microbiology and epidemiology research, of designing EU projects, of working in the French overseas regions, and of partnerships in the global South and with the Ministry of Agriculture and international organizations (FAO, OIE, etc).

#### **What is your main responsibility?**

In line with CIRAD's new scientific and partnership strategy, I am involved in steering both the establishment as a whole and my department's research units. The aim is to build a new vision of integrated plant health approaches – like what is being done for animal health – and a new slant on plant breeding, focusing on adaptation, against a backdrop of global change (climate, socioeconomics, etc).

#### **What is CIRAD's main asset in terms of its remit of agricultural research for development in the global South?**

I would quote two: on the one hand, we are capable of combining top-level research with strong partnerships built over many years, in both North and South, and on the other, we have highly dynamic teams capable of high-impact research operations. ●

### **Jean-Paul Laclau, new Director of CIRAD's Performance of Tropical Production and Processing Systems Department (PERSYST)**

Since 15 October 2018, our PERSYST department has been headed by a specialist in soil-plant relations.

Jean-Paul Laclau was previously Deputy Head of the Functional Ecology and Bio-geochemistry of Soils and Agrosystems joint research unit.

#### **What added value does your past experience bring to CIRAD?**

I worked in New Caledonia, Republic of Congo and Brazil for more than 20 years, which gave me a good idea of the opportunities and constraints linked to CIRAD's activities in the global South. I also bring with me my experience of working with the private sector, teaching in universities in the global South, of project design, and of heading a research unit specializing in studying soil-plant relations and ecosystem services within Mediterranean and tropical agrosystems.

#### **What is your main responsibility?**

In addition to supporting our research units on a day-to-day basis, my main responsibility is to renew CIRAD's scientific vision in terms of agronomy and tropical product processing. I shall be heavily involved in implementing CIRAD's strategic vision in the coming years.

#### **What is CIRAD's main asset in terms of its remit of agricultural research for development in the global South?**

CIRAD has many assets, but if I had to choose one, it would be its longstanding partnerships, which have served to build strong links between CIRAD and a number of research, development and training organizations in the global South. Many of the research and development projects planned in the coming years will recognize the impact of the collaborative research conducted by CIRAD and its partners. ●

### **Sylvain Perret, new Director of CIRAD's Environments and Societies Department (ES)**

After being the department's Deputy Director since October 2014, Sylvain Perret was appointed Director on 12 March 2018.

#### **What added value does your past experience bring to CIRAD?**

I have worked for CIRAD for more than thirty years, mainly overseas (French overseas regions, Africa and Asia). I have conducted research in several fields, taught in universities in the global South, published widely and supervised researchers from southern countries. This wide range of experience, combined with my in-depth knowledge of the ES department and of CIRAD, is proving very useful in my new post.

#### **What is your main responsibility?**

To support the department's research units by ensuring that their various projects, geostrategies, assets and initiatives make up a coherent whole. I also help our Heads of research units manage their human resources (researchers), particularly overseas postings, which we need to revitalize. Lastly, I also help those units fulfil the remit set for CIRAD, notably through the programming frameworks laid out in the vision and the SPSOs, which the units played an active part in drafting. The majority of the ES department's researchers specialize in the human and social sciences, are in direct contact with the institutional and political spheres in the global South, are heavily involved in development support projects and appraisals, and focus on the meso and macro scales (value chains, territories, markets, regional bodies, etc). My role as departmental director is therefore also to promote their contributions and coordinate them as effectively as possible with the issues being addressed by the other two departments.

#### **What is CIRAD's main asset in terms of its remit of agricultural research for development in the global South?**

Today's CIRAD has highly qualified human resources, notably an exceptional combination of seasoned, hardworking managers and senior staff members, and enthusiastic, very bright junior researchers. This enables us to tackle the challenges posed by agricultural and rural development in the global South with great optimism. In particular, we are in a position to embark upon ambitious, demanding projects for which the expertise and know-how of our partners and experienced CIRAD staff members, combined with the enthusiasm and excellence of our younger members, are valuable, unique assets. ●



D.R.

## **Alioune Fall, Chair of the CIRAD Science Council since March 2018, Director General of the Institut sénégalais de recherches agricoles (ISRA)**

Alioune Fall has been a researcher with ISRA since 1984, and holds a PhD in Agricultural Engineering awarded in 1997 by Michigan State University (USA), focusing on agricultural technology and innovation management systems.

In 2000, he was appointed Director of Isra's agricultural research centre in Saint-Louis (Senegal), in 2008 ISRA Scientific Director, and in 2013, Director General.

**“It is a new experience for me to be involved in building CIRAD's strategic vision for its work with countries in the global South.”**

### **Why did you agree to chair the CIRAD Science Council?**

The links between Isra and CIRAD date back to the founding of the two structures. Since 1974, ISRA has worked to ensure the continuity of the work done in the past by Irat, IRHO, IEMVT and CTFT (organizations on which CIRAD was built). The research issues addressed by our two organizations are entirely interlinked. After working for five years with ISRA's scientific management team, I naturally agreed to be a member of CIRAD's Science Council and subsequently its Chair. It is a new experience for me to be involved in building CIRAD's strategic vision for its work with countries in the global South.

### **What are your priorities as Chair?**

Alongside my duties as ISRA Director General, since 2014, I have been Chair of the WECARD\* Governing Board and am also Vice-Chair of the Board of Directors of FARA\*\*. Over the past decade, CIRAD has implemented a strategy of working with the global South via a network of platforms in partnership for research and training (dPs). It is important that I use my experience to support CIRAD in this type of partnership, built around research for development issues, which have added value for the countries that benefit. Another priority is to promote scientific exchanges and encourage CIRAD researchers to help build capacity among researchers from the global South.

### **What do you think is CIRAD's main asset in terms of its remit of agricultural research for development in the global South?**

CIRAD has a long history of working with countries in the region. It has been involved in steering research in those countries with a view to sustainable development. CIRAD has five advantages over other organizations: its experience of countries in the global South; the existence of databases on the main products from those countries; regional offices to ensure outreach work; researchers prepared to move overseas to work in the field, alongside teams from national agricultural research systems; and experience of using scientific and technical information tools. ●

\*WECARD: West and Central African Council for Agricultural Research and Development, an international non-profit association of national agricultural research systems (NARS) in 23 countries, covering more than 40% of the population in Africa. [www.coraf.org](http://www.coraf.org)

\*\*FARA: Forum for Agricultural Research in Africa. Continental umbrella organization in charge of coordinating and promoting agricultural research for development (AR4D). FARA is the technical body of the African Union Commission for matters relating to the agricultural sciences, technology and innovation.

## EXPERTISE

### Senegal: the elimination of the tsetse fly will boost the livestock sector

A longstanding collaboration between CIRAD, ISRA, Senegalese veterinary services, the Ministry of Agriculture in Senegal and the IAEA has eliminated the tsetse fly from a 1000-km<sup>2</sup> zone in the Niayes region of the country, using the sterile insect technique.

The cattle disease carried by tsetse flies is the main obstacle to the development of livestock production. This success story should lead to a change in livestock production systems in the region and to an increase in meat and dairy production, which is estimated at 2.8 million euros a year, according to the impact study conducted alongside the project.

[Doi.org/10.1093/biosci/biy155](https://doi.org/10.1093/biosci/biy155)

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A. Labeyrie © CIRAD

**SCIENTIFIC RESEARCH**

**Oil palm: few areas in Africa reconcile high yields and primate protection**

An international research team including scientists from CIRAD has assessed the potential impact on primates of the expansion of oil palm cultivation in Africa. The lessons learned from Southeast Asia leave no room for doubt: there are very few areas in which oil palm and primates could cohabit. Levers for the successful conservation of African biodiversity do exist, such as reducing future demand for palm oil (notably for biodiesel) and increasing yields in existing plantations (for instance by using high-quality seeds and adopting better farming practices).

PNAS. Doi : 10.1073/pnas.1804775115

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**SCIENTIFIC RESEARCH**

**Natural areas are less affected by viruses than cultivated zones**

A study by an international team of researchers in Camargue (France) and the Cape (South Africa) showed that cultivated areas are more affected by viral epidemics than non-cultivated zones. The clustering and concentration of genetically similar organisms, as with crop varieties, fuels epidemics.

*ISME Journal*  
Doi : 10.1038/ismej.2017.155

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Fynbos, a natural plant formation characteristic of southern South Africa in which the study was conducted



© Ph. Roumagnac, CIRAD

**SCIENTIFIC RESEARCH**

**A revolution in citrus botanical classification**

An international study involving CIRAD and INRA has revolutionized the botanical classifications of citrus fruits. The information obtained paves the way for new varietal breeding strategies for these fruits, which are amongst the most widely grown worldwide.

*Nature*

Doi : 10.1038 /nature25447

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The indri, also called the babakoto, is a lemur of the family Indriidae. Along *Propithecus diadema*, the indri is the largest living lemur, and like all others, it is endemic to Madagascar

**EXPERTISE**

**Deforestation is threatening Madagascar's unique biodiversity**

Some 44% of Madagascar's natural forests have disappeared over the past 60 years, threatening its unique biodiversity (90% of species are endemic). The main cause of deforestation is farming, so the aim is to raise awareness, increase international aid and reconsider conservation and development strategies.

*Biological Conservation*. Doi : 10.1016/j.biocon.2018.04.008

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P. Dugué © CIRAD

## PARTNERSHIPS

### Sodecoton, IRAD and CIRAD have committed to making the cotton supply chain in North Cameroon more competitive

A new tripartite agreement was signed in January 2018 for five years, between Société de Développement du Coton du Cameroun (Sodecoton), a driving force in the agricultural economy in North Cameroon, the Institut de recherches agricoles pour le développement (IRAD) and CIRAD, with a view to making the cotton supply chain more competitive and boosting the technical and economic performance of the farms involved, while preserving production capacity in production zones.

## SCIENTIFIC RESEARCH

### Phytotherapy in aquaculture

Scientists at CIRAD and IRD are testing the use of medicinal plants as an alternative to antibiotics in fish farms. Plants are chosen based on information gathered in the literature and in the field, in Madagascar and Southeast Asia, and are first studied in the laboratory, to assess their antibacterial properties, and then tested on experimental carp farms.

*Journal of Applied Microbiology*  
Doi : 10.1111/jam.13160

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© L. Tomutti

A pure line and two hybrids were studied under controlled environmental conditions, to understand the effects of coffee leaf rust on coffee plants

**SCIENTIFIC RESEARCH**

**Healthy coffee plants are more resistant to coffee leaf rust attacks**

Research conducted by CIRAD, in collaboration with Nestlé, shows that the use of vigorous hybrids, grown under shade with nitrogen fertilization, helps to limit the development of this disease that is having an increasingly devastating impact, largely because of climate change.

Doi.org/10.3389/fpls.2017.02025

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**EXPERTISE**

**Facilitating the adoption of new root, tuber and plantain banana varieties in Africa**

The Breeding RTB Products for End User Preferences (RTBfoods) project, launched in Cameroon in January 2018, set out to pinpoint the quality traits that determine the adoption of new root, tuber and plantain banana (RTB) varieties in five African countries (Benin, Cameroon, Ivory Coast, Nigeria and Uganda). It has a budget of 11.5 million euros\* over five years, and relies on a novel participatory methodology involving consumers, processors and researchers.

\* Main donors and co-funders: Bill & Melinda Gates Foundation, CIRAD, INRA, CIAT, JHI.

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D. Montet © CIRAD



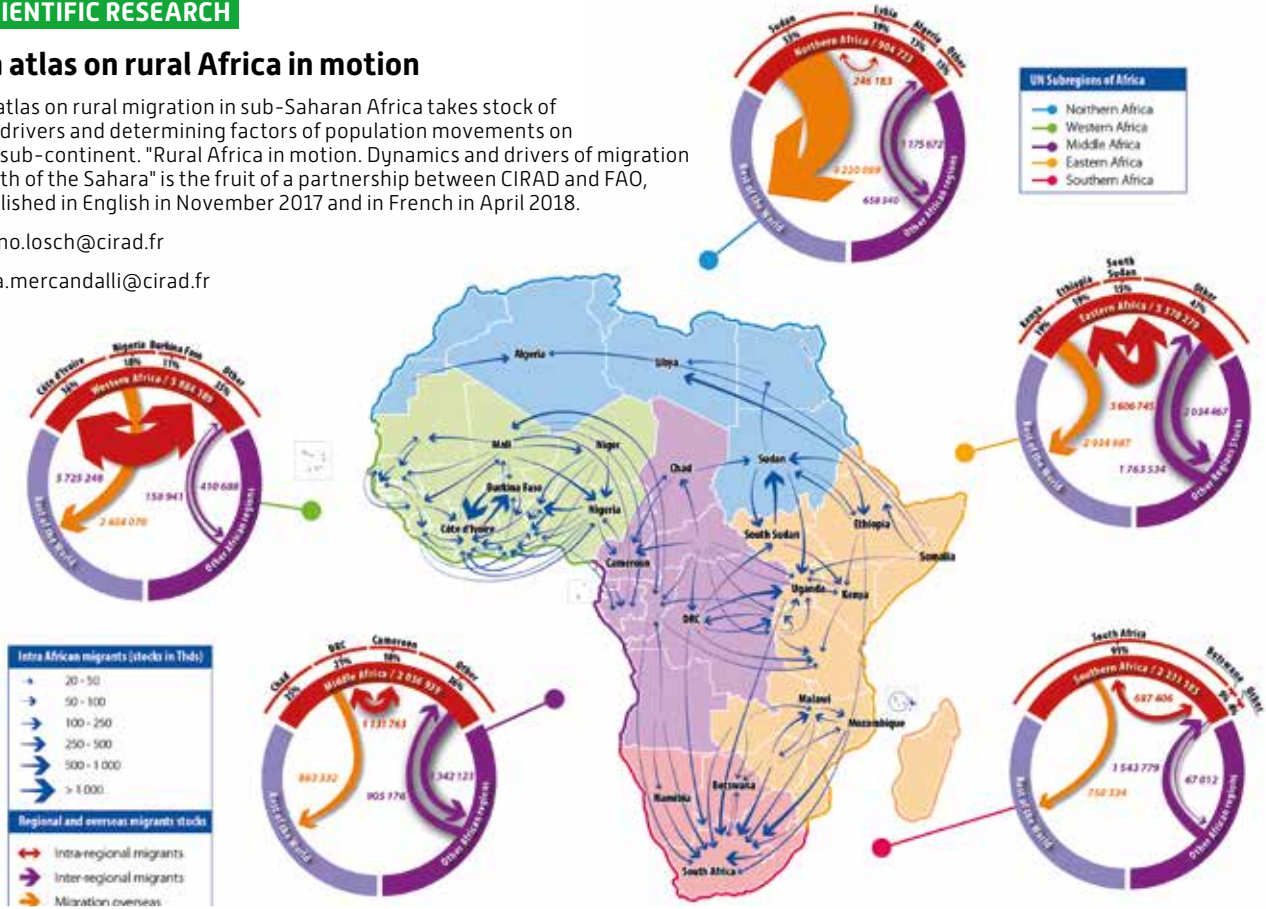
## SCIENTIFIC RESEARCH

### An atlas on rural Africa in motion

An atlas on rural migration in sub-Saharan Africa takes stock of the drivers and determining factors of population movements on the sub-continent. "Rural Africa in motion. Dynamics and drivers of migration South of the Sahara" is the fruit of a partnership between CIRAD and FAO, published in English in November 2017 and in French in April 2018.

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## EXPERTISE

### Building quality and metrology capacity in the Mediterranean

The countries of the southern Mediterranean and sub-Saharan Africa face major shared challenges linked to quality (agrifoods, energy, health protection, etc). Prompted by the work done as part of the EU QESAMED project, CIRAD continued in 2018 to build quality and metrology (the science of measurement) capacity within its partner organizations – training and research organizations, universities, competitiveness clusters – in the southern Mediterranean. The specialist Masters in metrology and quality launched in 2016 at Cadi Ayyad University, Marrakech (Morocco) is currently being extended to several other Mediterranean and African countries (Tunisia, Ivory Coast, Senegal, etc).

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A stylized illustration of a tree with a thick, gnarled trunk and a dense, intricate network of branches and roots. The tree is rendered in a light, sketchy style against a dark green background. The roots spread out across the bottom, and the branches reach upwards and outwards, filling the left and center of the page. The overall aesthetic is organic and scientific.

# Scientific research as a development driver

In the light of the challenges posed by sustainable development of countries in the global South in the current demographic, climate, environmental and social context, CIRAD and its partners are convinced of the growing need for knowledge and innovations. To address those challenges and succeed in using research to support societies in the global South through a range of unprecedented transitions, CIRAD has identified **six key thematic fields**.

Each of those fields covers a major research issue shared with our partners in the global South, in which CIRAD has opted to invest collectively, taking an integrative, multi-disciplinary approach, with the aim of renewing, diversifying and extending its scientific outputs and partnerships.

## BIODIVERSITY

# Genetics: three major discoveries for better understanding and promotion of the diversity of cultivated plants



### The astonishing genetic diversity of rice

By analysing the genetic diversity of more than 3000 varieties, an international consortium, including CIRAD, has revealed the astonishing genetic diversity of rice. Rice was already known to have extraordinary adaptive and agromorphological diversity, but the study revealed that its diversity was also the result of a variation in gene content. *"Of the 24 000 known gene families in rice, only 60% are shared by all the different varieties. The others may be either present or absent, depending on the variety. You can imagine the impact of that diversity on the species' capacity to adapt! This knowledge paves the way for a new era in varietal breeding"*, says Jean-Christophe Glaszmann, a CIRAD researcher and co-author of the study.



### Inactivating the RECQ4 gene boosts crop breeding operations

Researchers from CIRAD and INRA recently showed that inactivating a gene, RECQ4, leads on average to a three-fold increase in recombination in crops such as rice, pea and tomato. The gene inhibits the exchange of genetic material via recombination (crossover) during the sexual reproduction process in crops. This mechanism, which is common to all organisms, determines the genetic diversity of species, and is also a vital crop improvement tool, since it serves to combine the worthwhile characters found in different individuals within a single plant. However, this is a lengthy process, as there are very few recombinations in

each generation: on average, there are just one to three genetic material crossover points between the chromosomes for every cross. That is what makes this discovery really useful. "Switching off" the RECQ4 gene multiplies the number of crossovers, speeding up the breeding process and making it possible to develop varieties suitable for ever more unstable environments more rapidly. ●

*Nature Plants*

Doi: 10.1101/343509

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This new data means that rice has the largest set of documented genomic variations for a cultivated species. The data is available on open access, making it a valuable tool for breeders all over the world, whether the aim is to analyse the adaptation capacities of rice or to target varietal improvement more efficiently on certain genes, gene families or genome configurations likely to extend the scope for adaptation even further. ●

*Nature*. Doi: 10.1038/s41586-018-0063-9

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R. Carajou © CIRAD

## Sugarcane: a highly complex genome that has finally been sequenced

Because of its huge complexity, which had always defeated conventional sequencing techniques, the sugarcane genome had never been sequenced. A discovery made at CIRAD some 20 years ago has now enabled an international team to develop a novel sequencing method. It is based on the similarity between the genome structures of sugarcane and sorghum, with numerous

genes occurring in the same order. The sorghum genome, which is much simpler, was used as a template to assemble and select the sugarcane chromosome fragments to sequence. *"Thanks to this novel method, the reference sequence obtained for a cultivar from Réunion, R570, is very good quality"*, says Angélique D'Hont, a CIRAD geneticist who coordinated the study. That reference sequence is

vital: without it, it will be impossible to fully sequence the sugarcane genome and analyse the variations between its varieties more precisely. This will bring sugarcane breeding into the age of genomics. ●

*Nature Communications*  
Doi: 10.1038/s41467-018-05051-5  
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### ● PLANT GENETIC IMPROVEMENT TECHNOLOGIES

#### **CIRAD is to make its position clear in 2019**

●

In March 2018, the CIRAD-INRA-IFREMER Joint Consultative Committee on Ethics issued a statement on new plant breeding techniques, particularly "genome editing". INRA and CIRAD sent a joint reply, and INRA subsequently issued a strategic positioning statement on the use of plant genome editing technologies. To expand on these three documents, with which it agrees wholeheartedly, CIRAD has begun drafting a supplementary statement on these types of technologies, illustrating the partnership aspect of the issue resulting from its mandate for research in the global South. The statement is due to be finalized by the end of 2019.

## AGROECOLOGICAL TRANSITIONS

### Crop pests are also managed on a landscape level

In a study of the incidence of an insect pest on a network of smallholder millet plots in Senegal, researchers from CIRAD and their partners revealed the natural regulation services rendered by biodiversity. They consider that those services are governed by ecological processes whose spatial organization extends well beyond that of the cultivated plot. Agroecological pest management thus requires a collective, territory-based approach, built on bridges between agronomy, ecology and the social sciences.

This work shows that agriculture can help preserve biodiversity, which in return delivers services such as crop pest regulation. ●

*Biological Control*

Doi: 10.1016/j.biocontrol.2018.10.006

*Crop Protection*

Doi.org/10.1016/j.cropro.2018.09.003

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C. Dangléant © CIRAD

### CIRAD has signed the DORA

In signing the San Francisco Declaration on Research Assessment (DORA) on 3 July 2018, CIRAD joined 494 other organizations in defending the principle of no longer using journal-based metrics – such as impact factor – to measure the quality of scientific articles or assess a researcher's contributions, or in recruitment, promotion and funding decisions.

DORA : <https://sfдора.org/>

## CLIMATE CHANGE

### Boosting the climate effects of land worldwide

Governments and scientists have hitherto underestimated the importance of land use for mitigating climate change, according to an article published in the journal *Nature* on 13 December 2018. The authors suggest a new method for assessing the capacity of land (soil and vegetation) to mitigate greenhouse gas emissions, depending on how it is used (forest, pasture, crops, livestock production, etc). The method also measures the indirect impacts of land use changes. It is dubbed the "carbon benefits index", and can be applied on a territory as well as a plot scale. Amongst other things, it has shown that a hectare of well-managed pasture in Brazil has the same carbon storage capacity as a hectare of replanted forest in Europe or the US. ●

*Nature*

Doi.org/10.1038/s41586-018-0757-z

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© N. Cialdella, CIRAD

## FOOD SYSTEMS

### Could organic farming drive development in Africa?

In Africa, organic farming is growing slowly but steadily. At CIRAD, scientists are studying the technological and institutional conditions required to ensure that organic farming can meet the challenges of food security and population growth on the continent. A selection of the results presented at the 4th African Congress on Organic Agriculture organized in Senegal in November 2018.

A collective summary, led by Ludovic Temple, an economist with CIRAD, documents how organic production could contribute to the development of the continent's agricultural and food sector. To develop organic farming in all its diversity, it must be certified whatever the contexts and the target markets. *"In which case, the European example, where third party certification has superseded all the other systems, should not be followed,"* asserts Sylvaine Lemeilleur, a CIRAD economist. Elsewhere in the world, several certification systems coexist, which is often better.

For her part, Pauline Bendjebbar, a PhD student working with CIRAD, devoted her political science thesis to the institutionalization of organic farming in Africa. Her work led her to deconstruct two widely held assumptions about organic farming in Africa:

- Organic agriculture in Africa is not "organic by default"; chemical inputs generate serious problems and pollution, particularly in peri-urban zones.
- African organic agriculture is not solely geared towards exports to countries in the North. Many organic farming initiatives have been launched with food security goals. ●

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## PLANT, ANIMAL AND ECOSYSTEM HEALTH



### Peste des petits ruminants: a model for use in eradicating the disease

**After rinderpest, it is peste des petits ruminants that the OIE and FAO want to eradicate by 2030. This disease is currently found in Africa, Asia and the Middle East, and was detected in Europe in the summer of 2018. Researchers from CIRAD have suggested a model that serves to prioritize zones for vaccination. This is a welcome alternative to mass vaccination campaigns, which are both costly and highly complex to implement.**

Eradicating peste des petits ruminants is an ambitious objective that is nevertheless looking increasingly realistic, notably thanks to a targeted vaccination strategy centring on production systems that act as a virus reservoir. This was the conclusion drawn by a scientific study coordinated by an epidemiologist from CIRAD and published in the journal *PNAS* in July 2018.

Researchers from CIRAD and their partners\* combined a dynamic model that simulates virus spread with a national serological study in Ethiopia. The information obtained served to assess the level of virus transmission within endemic zones and the vaccine coverage required to halt transmission and eliminate the disease.

*"Peste des petits ruminants is a particular threat to the livelihoods and food security of the most vulnerable farmers"*, François Roger, a CIRAD epidemiologist and co-author of the study, points out. Through its ASTRE research unit, CIRAD is the EU reference laboratory for peste des petits ruminants. ●

*PNAS*. Doi.org/10.1073/pnas.1711646115

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\* Royal Veterinary College, University of London (UK), National Veterinary Institute (Ethiopia), INRA-ENVT (France), Epicentre (France), London School of Hygiene & Tropical Medicine (UK), City University of Hong Kong (China).



## 2018, YEAR OF "GENDER" FOR CIRAD

# Gender-SMART: A European project on gender issues in agricultural and life sciences, coordinated by CIRAD

Following a European Commission call for proposals under programme H2020 ("Science with and for Society"), CIRAD has been chosen as coordinator of Gender-SMART, a project that it submitted with eight European partners. The project will have almost 3 million euros of funding over four years.

Each organization has committed to implement a gender equality plan centring on four shared issues:

- Building a gender equality culture
- Developing equal career support measures
- Reshaping decision making and governance
- Integrating gender in funding, research and training.

Expected impacts: equal career opportunities and decision-making powers for men and women at the organizations that have signed up to the project, and gender-aware institutional and research strategies.

### THE CONSORTIUM MEMBERS:

#### Seven organizations defining and implementing gender equality plans:

Centro De Investigaciones Cientificas Y Tecnologicas De Extremadura (Spain); Centro Internazionale Di Alti studi Agronomici Mediterranei (Italy); Teagasc - Agriculture And Food Development Authority (Ireland); Wageningen University and Research (Netherlands); Cyprus University of Technology (Cyprus); Agence Nationale de Recherche (France); CIRAD (France).

#### Two technical partners specializing in gender:

Yellow Window (Belgium); Institute Of Sociology Of The Academy Of Sciences Of The Czech Republic Public Research Institution (Czech Republic).

## Interview with Cindy Van Hyfte, Gender Officer at CIRAD



“  
*CIRAD has everything to gain from investing in gender, for the good of all.*”

**Just as CIRAD was appointing an officer for gender equality in the workplace in June 2018, it was chosen to coordinate the EU Gender-SMART project.**

**You are operational leader of the EU Gender-SMART project and CIRAD Gender Officer. Can you explain how those posts fit together?**

The two operations, the EU project and the company agreement, which previously ran in parallel, are destined to converge. My dual mission is proof of CIRAD's determination to press ahead with a long-range policy of equality between the sexes in the workplace.

**What does this mean in practical terms?**

Every possible aspect of the issue of gender equality in the workplace will be addressed: awareness raising and changes in mindset, career paths, work-life balance, access to positions of responsibility, etc. Those aspects will be tackled with respect to CIRAD, along with the issue of gender in research content.

**What is the timeline?**

The EU Gender-SMART project will run for four years. The results obtained and the dynamic triggered are intended to be long lasting. Certain operations will be put in place very rapidly at CIRAD. The Human Resources Service, in particular, has already made progress on the topic, while certain researchers are already including gender in their research. However, the aspects surrounding corporate culture and changes in mindset and behaviour will take time.

**What will the benefits be?**

Everyone will benefit: men and women, support services and research units. This move towards institutional change is not some sort of war between the sexes, but a way of fostering dialogue and building on our differences and complementarities. CIRAD has everything to gain from investing in this issue, which will have a positive impact on wellbeing and will boost its image in the eyes of its donors and partners. ●

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# European Development Days 2018: CIRAD wants people to recognize the huge role women play in food systems



© Sandrine D.R.

**Sandrine Dury, a CIRAD economist specializing in gender issues, participated in European Development Days 2018, devoted to gender and to the role of female empowerment in development. Below are some extracts from her contribution.**

In most societies, women are absent from both the actual and the symbolic public sphere, where decisions relating to society are debated and made. In terms of food security, they are responsible for planning and producing meals, both at home and in commercial catering. They are also wholly or partly responsible for buying food for their family. Lastly, in sub-Saharan Africa, women make up half the agricultural labour force. They are

often experts and the guardians of farmers' seeds. They take charge of most food product trading and processing operations, which are vital for supplying urban and now rural areas. We must therefore recognize their huge contribution to food supply chains: they are the link between production and consumption!

Moreover, in some parts of sub-Saharan Africa, there is "hidden" hunger, which stems from the lack of power given to women. In those regions, cereal production is sufficient to satisfy the calorie requirements of the people who live there, but a third of children are small for their age due to cumulative growth delays of between six months and two years. Women in those areas rarely own agricultural land. They work under the authority of their husband, the "head of the household", who decides how work, crops and the income generated by any sales from the family farm are shared. With the increase in the size of family farms, linked to mechanization, women are increasingly called upon by the head of their household to work, which impinges on their own activities, the diversity of their family's diet, and their ability to take care of themselves and other family members, particularly children.

**In terms of research,** considerable work is being done on gender issues in the

fields of development, nutrition and agriculture, and there is substantial controversy. CIRAD is currently working with IRD and partners in Burkina Faso (INERA and IRSAT) on the **links between agricultural production and dietary diversity and nutrition**. Alissia Lourme Ruiz, who worked on her PhD at CIRAD, showed that empowering women in agricultural (their own plots) or financial terms (income from their own activities or money given by the husband) ensures a more diverse, nutritionally balanced diet for both them and their children. ●

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**“  
In these rural environments, a woman's income is apparently a better lever for the quality of their diet and that of their children than the level of agricultural production on the farm.”**

Alissia Lourme Ruiz, researcher



Vietnam. V. Porphyre ©CIRAD

Madagascar. E. Penot ©CIRAD

Indonesia. A. Rival ©CIRAD

Peru. M. Dulcire ©CIRAD

Morocco. B. Faye ©CIRAD

Senegal. C. Dangléant ©CIRAD





# Expertise in support of agricultural value chains and public policy

CIRAD has exceptional, longstanding and recognized expertise in the technical aspects of tropical agricultural value chains, notably for renewing production approaches to include the concepts of agroecology.

CIRAD also provides scientific and institutional support for public policy making in the countries of the global South, while contributing to international debate on major global issues such as agriculture, food, biodiversity and climate change.

Lastly, CIRAD considers that ensuring long-term agricultural development in the global South and drafting appropriate public policies means generating relevant knowledge.

This development through research relies on the capacity of countries to build suitable higher education and research systems. Training (both academic and professional) in the global South is a vital aspect of CIRAD's operations.

## INFORMING PUBLIC POLICY IN THE LIGHT OF THE MAIN GLOBAL CHALLENGES

### The need for a transition to sustainable food systems

#### Rethinking food systems to meet the sustainable development goals (SDGs)

Food systems are located at the crossroads between the many issues and contradictions surrounding sustainable development: food and nutritional security, human and ecosystem health, natural resource renewal, climate change, territorial dynamics, political stability, and social justice. An international group of experts, including researchers from CIRAD, is calling for profound changes in food systems in order to meet the sustainable development goals set by the UN in 2015, and the terms of the Paris Agreement on climate.

The authors propose a four-pillar strategy:

- Drastic changes in consumption patterns, with a shift towards healthy eating;
- Ensuring that agricultural production and food supply chains play a greater role in sustainable development;
- Mitigating climate change by means of new farming practices;

- A package of operations aimed at rejuvenating rural territories. ●

Agronomy for Sustainable Development  
Doi: 10.1007/s13593-018-0519-1

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“ We need a comprehensive transformation in food systems, centring on different paradigms and models from those of the 20th century. ”

Patrick Caron, lead author of the article and researcher with CIRAD



Irrigated rice growing in the Majes valley, Peru

B. Locatelli © CIRAD

#### OPINION PIECE

### We must act now if we are to feed the world

In an opinion piece in Le Monde dated 15 November 2018, the Presidents of CIRAD and INRA called for a rethink of global land use to ensure healthy, diversified, quality food supplies for all. The call was prompted by the results of the Agrimonde-Terra foresight study, which concluded with the publication of a book, *Land Use and Food Security in 2050: a Narrow Road*. The book recommends cooperation between producers and agrifood firms, civil society and governments, and strong public policies. It highlights the interdependence of the problems to be addressed and the global environmental impact, which mean we need to draft cross-sectoral policies and strategies that are simultaneously global, national, regional and territorial, and to build agricultural and food systems that are much more knowledge-intensive rather than consuming natural resources. The Agrimonde-Terra approach is there to help decision-makers identify the drivers required to move towards the land use changes that are vitally important to preserve the environment, mitigate climate change, guarantee a healthy diet for all, and foster more inclusive rural development.



Farm butter (qebé) seller at Wonshi market (Ethiopia)

G. Duteurtre © CIRAD



V. Porphyre © CIRAD

Market, Moroni, Comoros

## A sustainable future for 10 billion people in 2050

By 2050, the world will have almost 10 billion people. It will be impossible to feed everyone without exacerbating poverty, accelerating deforestation and increasing GHG emissions unless we start making substantial changes to our food system now.

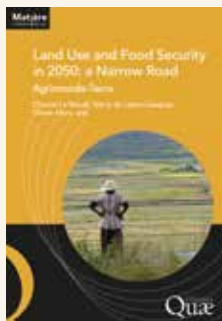
This issue is covered in a new report, *Creating a Sustainable Food Future*, produced by WRI\*, in partnership with

CIRAD, the World Bank, the UN and INRA. It suggests several ways of satisfying the expected rise in demand, of over 50% for food and almost 70% for animal-based products. It concludes that feeding the world sustainably will mean reducing demand, notably by cutting food loss and waste, increasing crop and livestock productivity, stopping deforestation, restoring peatlands and degraded land,

improving aquaculture and managing wild fisheries more effectively, and using innovative technologies and farming methods that lower agricultural GHG emissions. ●

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\*World Resources Institute



### Land Use and Food Security in 2050: a Narrow Road

How can we best use land to ensure food and nutritional security for all? It will be a hard, long and narrow road, and above all, it means a change in direction. This is demonstrated in a book on the Agrimonde-Terra foresight study, *Land Use and Food Security in 2050: a Narrow Road*. The book gives details of the four-year study by CIRAD and INRA, backed by a number of experts from all over the world.

*Land use and food security in 2050: A narrow road*, C. Le Mouél, M. de Lattre-Gasquet, O. Mora (ed.). Quæ, 2018. [available free on line].

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## COP24: agriculture and climate talks

**CIRAD has been working for many years on the consequences of climate change for farming systems in the global South. Its experts are involved in the debate on these environmental issues, and their work serves to inform the negotiating process.**

### 4 per 1000 initiative: for an ambitious scientific programme

On the eve of COP24, on 7 and 8 November 2018, a workshop in Sète (southern France) brought the French scientific community together to discuss the issues surrounding the 4 per 1000 initiative, which centres on soils and their role in food security and climate.

During the workshop, the scientific community launched a call for funding for an ambitious scientific programme, centring on four topics: the mechanisms involved in and the potential for carbon storage in soils; land management practices and their consequences for carbon capture; maintenance and increase of soil carbon stocks; and monitoring, notification and verification of the results of capture operations.

The *Sète Call* was signed by several CIRAD researchers, with the support of CIRAD general management. ●

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T. Brévault © CIRAD

### At last! Agriculture has a place in climate talks at COP24

COP24, held in Poland, marked a first in terms of taking account of agricultural and food issues in climate talks. This step forward was the result of the Koronivia Joint Work on Agriculture, which called for the issues surrounding agriculture to be addressed through workshops and expert meetings throughout 2018. CIRAD participated in those workshops, along with INRA and IRD. Their contribution highlights the vulnerability of agricultural activities in the face of climate change and the imperatives of food security, particularly in the global South. Another message is that the negotiators must not look at the issues solely from a global

perspective, but should also take account of the more local level, to reflect the complexity of systems in the global South.

Lastly, it highlights the many dimensions of agriculture, as both a cause and a victim of global warming, and as a source of mitigation solutions, such as agroforestry and carbon capture in the soil. CIRAD is doing a lot of work in this field: 23 research units are involved, through more than 60 research projects, with almost 320 publications between 2015 and 2017. ●

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### Perspective, the CIRAD policy brief

Each issue, written by CIRAD researchers and their partners, focuses on the results of their research and aims to fuel debate, change ideas and support decisions.

In 2018, *Perspective* covered the following topics:

- open source for seeds, which could be a new opportunity for innovation [issue 49, December 2018];
- organic agriculture in Africa, an agricultural development driver [issue 48, October 2018];

- climate-smart agriculture, agroecology and the 4 per 1000 initiative, a winning combination for fighting climate change [issue 47, October 2018];
- multi-criteria evaluation to map disease risks and support health decision-making in low-income countries [issue 46, June 2018];
- agroecology in Latin America and the Caribbean and its integration into public policy [issue 45, June 2018].

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Bagging dried cocoa beans, Cameroon

M. Barale © CIRAD

## VCA4D: generating knowledge of value chains, to fuel policy dialogue

The Value Chain Analysis for Development project (2016–2022), funded by the European Union (16 million euros) and implemented by Agrinatura, is into its third year. It brings together multi-disciplinary and multi-organization teams of researchers to analyse value chains in support of policy decisions: dialogue between EU delegations and its local partners, budget support and investment operations. Its experts have opted for a rigorous methodology that combines economic analysis, life cycle assessment and social analysis, to determine to what extent value chains contribute to economic growth and are inclusive and sustainable from a social and environmental point of view.

Eighteen studies have already been completed and a further nine are under way. CIRAD is participating in 16 studies\* involving 19 of its researchers working with their peers from several European universities and research centres and universities in the global South (CGIAR members or independent). The project also has partnerships for various studies with FAO, COLEACP or GIZ.

To quote just one example, studies of beef in eSwatini (ex-Swaziland) and Zimbabwe have made policymakers aware of the bottlenecks hindering the improvement and fairer distribution of income within the value chain.

The PNG cocoa study showed that the business-oriented model promoted by international organizations was not the one that most benefits smallholders and did not serve to boost production.

Other activities in support of the studies are under way or being planned, such as result sharing workshops in the countries concerned, teaching of the methodology at several universities, notably in the global South, use of serious games to help local EU staff and their partners make use of the studies, improvements of the methodology, establishment of an information and knowledge system, and capitalization on the study results. ●

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\* Aquaculture in Zambia, cassava in Ivory Coast, mango in Burkina Faso, green beans in Kenya, palm oil and cashew nut in Sierra Leone, beef in eSwatini, beef in Zimbabwe, banana, mango and pineapple in the Dominican Republic, cocoa in Papua New Guinea, palm oil in Indonesia, cashew nut in Mali, cotton and cocoa in Cameroon, and pineapple in Benin.

## Biodiversity: the situation in Africa is cause for alarm

**Both on the scale of the continent as a whole and of individual countries, the situation is alarming: biodiversity is shrinking throughout Africa, threatening its people, who largely depend on natural resources to survive.**

Jacques Tassin, an ecologist with CIRAD, looks back at the IPBES\* report on global biodiversity, in which he participated, and particularly at the situation in Africa.

### How did you work on this report?

**Jacques Tassin:** We worked for three years to assess the state of the biodiversity and ecosystem services in the main four world regions: the Americas, Africa, Asia-Pacific and Europe-Central Asia. The study involved 550 experts. A hundred or so experts worked on the assessment in Africa, two thirds of whom came from the continent.

### What are the figures for Africa?

**J.T.:** I'm afraid they say it all! Things are moving really quickly in Africa, and we have already reached many points of no return. Population growth, habitat degradation and global warming are the major causes of this decline. Half the birds and mammals in Africa are likely to die out between now and 2050. The trouble is that more than 60% of the population in Africa depends directly on the services rendered by nature. The very conditions for the growth of the continent are under threat. And by 2050, there will be twice as many people in Africa.

### What lessons can we draw from this type of assessment?

**J.T.:** The figures issued by IPBES are essential. They serve to measure the speed at which our environment is deteriorating. They should hopefully influence policymaking. However, I have the impression that we are still focusing too much on quantifying the living world and that paradoxically, we are losing sight of it. The contemporary world is becoming increasingly virtual, digital, artificial and technical, thinking only of our material needs. Yet it is our very lifestyle that is eroding biodiversity.

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\*IPBES: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

## SUPPORTING THE DEVELOPMENT OF CROP AND LIVESTOCK PRODUCTION CHAINS

### A step towards organic farming in the West Indies, with the banana supply chain

By dint of forty years of research, CIRAD has enabled banana producers in the West Indies to withstand market crises.

Over some twelve years or so, pesticide volumes have been cut by 75%, and the sector is currently testing organic Cavendish banana growing, in agroforestry or monoculture systems, using a new variety developed by CIRAD in Guadeloupe that is resistant to black Sigatoka disease, the main problem with Cavendish bananas. Other resistant varieties have been created and are currently being tested for Caribbean markets. ●



### Impact of research: CIRAD publishes two methodological guides

In 2014, CIRAD undertook to develop a culture of impact within the organization. To this end, it built the ImpresS (Impact of research in the South) approach, centring on two complementary pillars: a look back at past experience, through impact assessments of completed projects and programmes, and greater integration of impact aspects when drafting future projects. CIRAD is already using this approach to accompany the design process for around 30 different projects, and has published two methodological guides, available on line, that explain how to implement the approach.

To download:  
[agritrop.cirad.fr/586223/](http://agritrop.cirad.fr/586223/)  
[agritrop.cirad.fr/587110/](http://agritrop.cirad.fr/587110/)



Cane straw being transported to the highlands of Réunion for use on cattle farms

© François Guerrin, CIRAD

### Réunion: agricultural recycling of biomass

Livestock manure, green waste and crop residues are all by-products that could serve as organic fertilizer on farms in Réunion but have never yet been used to any great extent. CIRAD and its partners launched the GABiR project in 2017 in the aim of closing the loop. It set out to foster sustainable, circular management of the biomass available on the island and to involve a wide range of players, to ensure more rational biomass use. There is a real need for this type of project.

The task for the first year was to obtain a snapshot of current biomass transfers and the players concerned. Almost 8,000 players have been identified, in three sec-

tors: agriculture, urban areas and industry, and the by-products suitable for agricultural use have been quantified: the biomass produced by the agricultural sector itself comes to more than a million tonnes, agroindustrial by-products to almost 900,000 tonnes, and urban waste to more than 300,000 tonnes. The diagnosis pinpointed a certain number of constraints on by-product recycling: competition between different types of use, transport costs, regulation, social acceptance, etc. What remains is to pinpoint local and regional solutions. A dozen or so concrete proposals involving the agricultural sector, industry and local authorities have already been put forward. ●



## BOOSTING TRAINING OPERATIONS IN THE GLOBAL SOUTH AND SHARING KNOWLEDGE

### CIRAD is the second French research actor to open a scientific data platform

CIRAD has joined the international network of scientific data platforms, Dataverse. It was the second French research actor, after Sciences Po, to join the network, which enables researchers from member institutions to freely deposit and document their data, whether primary, secondary, qualitative or quantitative. This research data is the result of modelling, experiments, measurements, long-term observations, and surveys, and reflects the diversity of scientific research at CIRAD. ●

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R. Carajou © CIRAD



© Thodonal / Adobe Stock

### CIRAD experts are involved in MOOCs

**MOOCs – online courses over a few weeks – are a new way of disseminating knowledge, and CIRAD researchers are involved in a large number of them**

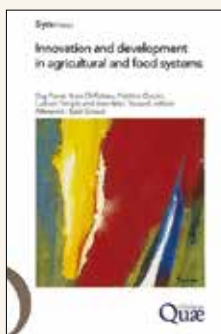
Three CIRAD experts participated in the "Socially sustainable development" MOOC (produced by UVED), which was chosen as the best MOOC developed by a university/college at the "MOOC of the Year" awards. This free course, open to all, runs for four weeks and is intended to inform, raise awareness and encourage action on the 17 SDGs. A second session is scheduled for September 2019.

Other MOOCs were launched in 2018: "Food wastage", offered by AgroParisTech, which is intended to trigger behavioural change

among the general public, to reduce waste; the first MOOC on crop seeds (by AgroCampus Ouest); the "Nectar" MOOC (produced by Montpellier SupAgro), which offers training in arthropod identification methods\*; and the MOOC on weeds produced by Tela Botanica, which trains students in weed science. ●

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\* The arthropods group includes insects, spiders, scorpions and millipedes, and fossil species such as trilobites.



### A book on innovation in agricultural and food systems

Researchers from CIRAD, with their peers from INRA and SupAgro, have produced a synthesis on a vital issue: innovation in agricultural and food systems. The book looks at how and why players innovate, and analyses and suggests support methods. It is based on fieldwork in France and many countries in the global South.

*Innovation and development in agricultural and food systems.*  
Synthèses Collection, 2018, Éditions Quæ  
ISBN 978-2-7592-2960-4, reference 02678  
Available as a free e-book, in English and French.

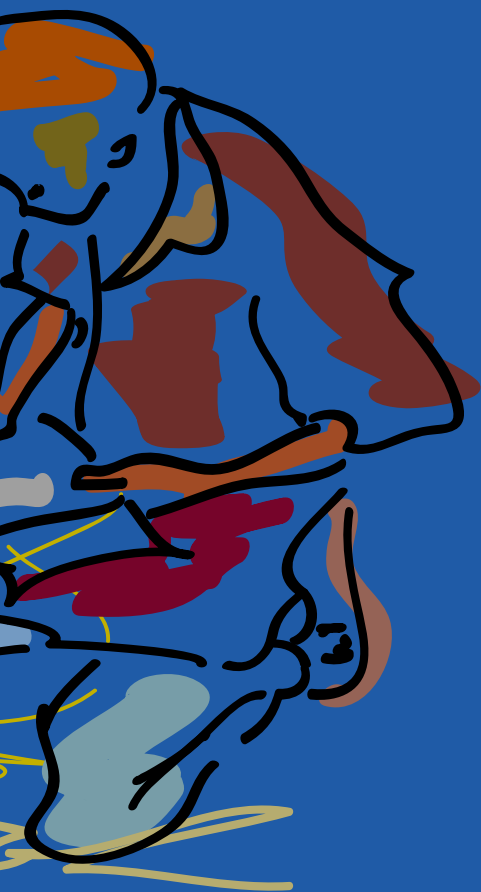


# Partnerships, a guiding principle for CIRAD

Working in partnership has always been at the heart of CIRAD's operations. Along with its scientific output, this is the second vital lever for sustainable development, a vision that CIRAD has always defended.

Over time, CIRAD has forged strong, long-lasting links with institutions in the global South and built a global network of partners and of twelve regional offices, through which it works with more than 100 countries. As ever, its geostrategic priorities continue to be Africa and the Mediterranean.

CIRAD is continuing to prove its commitment to Europe, by participating in building European initiatives and making an active contribution to European cooperation policy, particularly with Africa.



## WORLDWIDE

## FAO, CIRAD and INRA strengthen their partnership through a new agreement

On 16 February 2018, CIRAD and INRA signed a new, four-year partnership agreement with FAO. The goal of the three organizations is to step up their joint efforts and to develop more innovative initiatives in order to contribute to achieving the 2030 Agenda for Sustainable Development. ●



CIRAD President Managing Director Michel Eddi, FAO Director General José Graziano da Silva and INRA President Philippe Mauguin at the signing of the partnership agreement

**“With the renewal of this agreement, our partnership with FAO is now entering a new phase. CIRAD welcomes the intensification of this partnership, especially concerning agroecology and public policy support, which will enable us to innovate together and to shape the agriculture of the future in the context of the 2030 Agenda.”**

Michel Eddi, CIRAD President Managing Director



Food security and smallholder livelihoods are especially threatened by infectious and emerging diseases: buffaloes in Vietnam are affected by foot and mouth disease, which is endemic in the region

M. Peyre © CIRAD

## Global surveillance of human and animal health: three events to prevent health risks

In May 2018, CIRAD, the École nationale vétérinaire de Toulouse, INRA, ANSES and IRD held three international events at Montpellier SupAgro:

- the second conference of the International Society for Economics and Social Sciences of Animal Health (ISESSAH);
- a workshop organized by the research network Economic Reasoning for Improved Animal Health (ERIAH), entitled

“From economic assessment to policy development”;

- the International Forum on Innovation in Health Surveillance (InnovSur).

**Objectives:** to strengthen cross-sectorial collaboration and North-South partnerships in order to optimize global surveillance of human and animal health and ensure that health policy decisions take greater account of social and economic factors. ●

## Global partnerships for I-Site MUSE

Montpellier University of Excellence (I-Site MUSE), of which CIRAD is a founding member and in charge of international relations, has signed several general agreements with overseas universities. In March, it linked up with Wageningen University and Research (WUR, Netherlands), which topped the QS World University Rankings for Agriculture and Forestry in 2018. It signed an agreement with the University of Barcelona (Spain) in

July, and another with University of California, Davis (UC Davis, USA) in September. These general agreements should serve to consolidate and strengthen existing partnerships and promote exchanges and collaboration between scientific and academic teams in the fields of research and training. ●

<https://muse.edu.umontpellier.fr/li-site-muse/>

## EUROPE-AFRICA

### CIRAD is coordinating a research and innovation consortium to optimize food security and sustainable agriculture projects

Food and nutrition security and sustainable agriculture (FNSSA) top the list of priorities for the EU-AU research and innovation partnership launched eleven years ago. Against this backdrop, a new European project, LEAP4FNSSA\*, began recently. It associates 35 partners from Europe and Africa, who will work together to implement the EU-AU roadmap on FNSSA. It marks a new stage in the IntensAfrica initiative, alongside the LEAP-Agri\*\* project on research funding. The project intends to develop analysis and programming tools to inform managers and staff of research and innovation organizations, policymakers and stakeholders about the state of progress on implementation of the roadmap. This will enable public and private donors to pinpoint and respond to specific funding requirements.

Numerous projects are under way in Africa on food and agriculture issues, whether on agricultural production, storage and processing, waste management, pest and disease control, or optimization of value chains and markets. The consortium will boost their coherence and synergy. LEAP4FNSSA will focus on projects funded by the two unions and European and African countries, and subsequently, as far as possible, those from foundations, civil society and the private sector.

This new system of partnership and operational governance will involve many players from the public sector – donors, research centres, programme managers, universities, etc – and the private sector – businesses, farmers, users, training organizations, etc. A multi-stakeholder

platform will facilitate exchanges, consultation, organization of activities and access to information.

The LEAP4FNSSA project, which is scheduled to run for four years, with 5 million euros of funding from the Horizon 2020 programme, was officially launched on 1 November 2018, with a first meeting of all the partners in Accra, Ghana, on 30 January 2019. ●

\*A Long-term Europe-Africa Partnership for Food and Nutrition Security and Sustainable Agriculture

\*\* LEAP-Agri is a joint Europe-Africa research and innovation support initiative relating to food and nutrition security and sustainable agriculture. It associates 30 partners, including 24 ministries and funding agencies from 18 European and African countries, who have decided to join forces and pool funding to build an ERA-Net Cofund-type project with the financial support of the European Commission.



Sustainable food and nutrition security top the list of priorities for the EU-AU partnership

## AFRICA

**Africa and the Europe–Mediterranean–Africa axis are the main two geostrategic priorities for CIRAD's operations.**



P. Duqué © CIRAD

Developing irrigated cropping and managing natural resources and hydro-agricultural installations is a strategic priority for the Sahel Alliance

The workshop served to foster dialogue between representatives of village hunters and fishermen, of local groups and decentralized authorities, and of logging firms. Once the issues had been identified, the participants were encouraged to build a shared vision of what sustainable hunting and fishing in Mulundu province might look like, and the strategies required to achieve that vision within ten years. Much knowledge and information remains to be gathered to help stakeholders build sustainable wildmeat and freshwater fish supply chains. ●

## Sahel Alliance: CIRAD and African agricultural research institutions are stepping up their development efforts

CIRAD and the national agricultural research institutions of the Sahel countries (G5 Sahel – Mauritania, Mali, Burkina Faso, Niger and Chad – and Senegal) signed the Ouagadougou Declaration on 21 September 2018, cementing their shared intention to contribute actively to achieving the objectives of the Sahel Alliance.

The Sahel Alliance is an initiative launched in July 2017 by France, Germany and the EU, supported by the World Bank, the African Development Bank and the United Nations Development Programme. The aim is to build an international platform for cooperation in favour of development in the region.

The declaration cements the intention of CIRAD and the national agricultural

research institutions of the Sahel countries to contribute actively to achieving the objectives of the Sahel Alliance. Building on the progress made through research in partnership, the challenge is both to step up efforts in terms of innovation by listening to each and every stakeholder, and to scale up operations in terms of impact on beneficiaries. ●

## Sustainable Wildlife Management in Gabon. Building a shared vision of sustainable hunting and fishing

FAO and its partners in the Sustainable Wildlife Management programme (SWM), including CIRAD, brought together the various stakeholders in hunting and fishing for a workshop on the strategies required to reconcile food and nutrition security and biodiversity preservation, in Mulundu province.

## About the Sustainable Wildlife Management programme (SWM)

The SWM programme, funded by the European Union on the initiative of the African, Caribbean and Pacific Group of States (ACP), was launched in Rome in October 2017. It aims to reduce wildlife hunting to sustainable levels, protect threatened species, preserve biodiversity, maintain the essential role of wild species in forest and savannah ecosystems, and guarantee stocks and flows of the ecosystem services (ie food) that are vital for some of the world's poorest, most politically marginalized people. The programme will be conducted at eight sites in Africa, the Caribbean and the Pacific by FAO, in partnership with CIRAD, CIFOR and WCS. Duration: 8 years (2017–2024).



Agricultural production in the Senegal groundnut basin centres on dry cereals (millet) and legumes (groundnut, cowpea)

C. Dangléant © CIRAD

## Ivory Coast: signing of a memorandum of understanding concerning CIRAD by the French and Ivorian governments

Jean-Yves Le Drian, French Minister for Europe and Foreign Affairs, and his Ivorian counterpart Marcel Amon-Tanoh signed a memorandum of understanding concerning CIRAD in Abidjan on 18 October, in the presence of its President Managing Director Michel Eddi.

Marcel Amon-Tanoh stressed that the MOU between France and Ivory Coast, which is equivalent to a headquarters agreement, consolidates CIRAD's work in the country and makes a decisive contribution to the diversification of cooperation between the two countries. Jean-Yves Le Drian, for his part, said he was delighted at the signing, which recognizes France's expertise and clearly includes CIRAD in tackling development and growth issues in Ivory Coast. ●

## Agrisan Africa Centre of Excellence: a project supported by CIRAD and funded by the World Bank

CIRAD and Montpellier SupAgro supported the drafting of the proposal for an ACE entitled "*Agriculture pour la sécurité alimentaire et nutritionnelle*" (Agrisan - Agriculture for food and nutrition security) in Senegal. The proposal was submitted in response to the third World Bank call concerning the creation of centres of excellence in Africa. The project was led by an association of universities in Senegal, along with the Consortium pour la recherche économique et sociale (CRES), and coordinated by UCAD.

ACE Agrisan set out to help ensure that agriculture plays a major role in economic growth, food security and poverty alleviation in Senegal and the West African sub-region, through innovative training and research operations in every segment of agricultural value chains.

The World Bank has agreed to fund the project for four years. ●



## LATIN AMERICA

### Cooperation between France and Brazil in favour of the Nordeste region

The second seminar of the Franco-Brazilian network for the sustainable development of the semi-arid Nordeste (ReFBN), organized jointly by CIRAD, IRD, Funceme and the University of Ceará, was held in November 2018 in Fortaleza (Brazil). The aim was to consolidate the network, launched in late 2017, and identify the priority scientific topics around which to build joint research projects.

The Nordeste region has 28% of Brazil's population, and is the world's most vulnerable and most densely populated semi-arid area. A large part of the region is already affected by desertification, and it is now suffering the impacts of climate change, with consequences for its ecosystems, farming practices and human activity. This situation prompted representatives of more than twenty institutions involved in the fight against desertification in the semi-arid Nordeste to set up the ReFBN network in November 2017.

The second meeting of the network, in November 2018, served to pinpoint the topics and main thematic fields to be addressed by new partnerships and joint research projects between Brazil and France over the coming decade. A summary will be released in January 2019. According to Jean-Luc Battini, CIRAD Regional Director for Brazil and the Southern Cone, the event marked the consolidation of the ReFBN network, starting with the definition of its objectives for the next ten years, its resources (human, scientific and financial) and its fields of action. He feels that ideally, the aim is to set up one or more major research and development support projects facilitated by Franco-Brazilian cooperation and investment in the region, co-funded by the two countries, with the participatory involvement of development players. ●

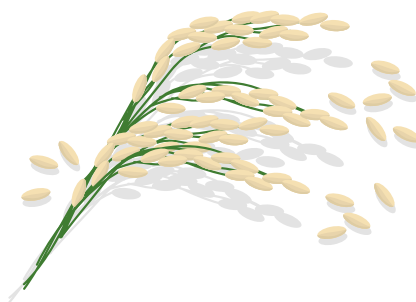
Rice harvesting in northern Vietnam



J.-C. Maillard © CIRAD

## ASIA

### Seminar on Franco-Vietnamese cooperation for sustainable agricultural development, and signing of a general agreement between CIRAD and VAAS



To mark the 45th anniversary (1973-2018) of diplomatic links between France and Vietnam and 100 years since the founding of the Phu Tho research centre, CIRAD, in partnership with the French Embassy, the Vietnam Academy of Agricultural Sciences (VAAS), and the Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI), organized a seminar on Franco-Vietnamese cooperation for sustainable agricultural development in the northern mountainous region. During the event, CIRAD and VAAS signed a general scientific cooperation agreement for the period 2018-2022. ●



## MEDITERRANEAN

### Tunisia: CIRAD signs an agreement on climate change with the Tunisian Ministry of Agriculture

CIRAD signed a partnership agreement for implementation of a programme of adaptation to climate change in vulnerable territories (PACTE) with Tunisia in May 2018. The programme centres on five Tunisian governorates (Bizerte, Kairouan, Le Kef, Sidi Bouzid and Siliana), and intends to foster adaptation to climate change in rural areas. It is funded by AFD (51.5 million euros) and the Fonds français de l'environnement mondial (2 million euros). ●



Woman filling jerry cans to be transported by donkeys. Kerouan, Tunisia

P. Dugué © CIRAD



An oasis and the surrounding mountains in the Draa Valley, Morocco

### Oases in North Africa

**A new issue of *Cahiers Agricultures*, coordinated by CIRAD and the partners in the SIRMA platform, describes oases that are full of life, despite strong constraints, and playing a part in the main current changes.**

This special issue of *Cahiers Agricultures* set out to share knowledge on the dynamics at play in the oases of North Africa and their links with livestock farming and non-agricultural activities.

Oases were long thought to be in decline, and have been subjected to profound, disruptive changes since the second half of the 20th century: emigration, urbanization, state projects and the arrival of investors.

Conventional oases have been joined by new agricultural extensions and projects, juxtaposing modern and very traditional forms of agriculture.

While they are very specific in terms of their strong climate constraints, oases are also involved in the main current changes: the opposition between tradition and modernity, the changing roles of the State, local communities and private players, recognition of the specificities of terroirs, concerns about natural resource sustainability, and environmental preoccupations. They find themselves in the forefront of a more universal debate about the ecological transition to sustainable development. ●

## FRENCH OVERSEAS REGIONS

### Technical innovation and agricultural transfer networks: sharing and dissemination

At the request of the Ministry of Agriculture and Food, CIRAD has been co-leader, along with ACTA, of the technical innovation and agricultural transfer networks in overseas regions (RITAs) since they were founded in 2011.

One of the key tasks involved is facilitating the exchange of information and encouraging research, training and agricultural development players to share their experiences in order to facilitate the transfer of agroecological innovations and their uptake by farmers.

In 2018, CIRAD and ACTA organized the sixth RITA meetings during the Paris International Agricultural Show. The meetings are now a not-to-be-missed event for overseas professionals, R&D players and the authorities, and this year highlighted the constraints on and drivers of the development of organic farming.



The participants in the AgroEcoDom meetings have adopted simple animal husbandry biosecurity measures, Réunion

© CIRAD

After the success of the meetings organized in Martinique in 2016 and Réunion and Mayotte in 2017, as part of the AgroEcoDom project, CIRAD set up a new consortium to respond to a call for projects ["*Mobilisation collective pour le développement rural 2018*" – Collective mobilization in favour of rural development 2018] launched by the *Réseau rural national*.

TransAgriDom, which was selected following the call, is intended to foster the synergy between territories and RITA stakeholders in order to ensure the agroecological transition in the French overseas regions. In particular, the project will enable continued

exchanges of experiences regarding issues shared by French Guiana (2019) and Guadeloupe (2020). ●

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## METROPOLITAN FRANCE

### Vectopole Sud, a Montpellier-based network innovating to control vector insects and crop pests



In the insectarium on CIRAD's Baillarguet campus, a member of Vectopole Sud

© CIRAD

In May 2018, Agropolis International (the scientific community in Montpellier-Occitanie devoted to agriculture, food, biodiversity and environment), of which CIRAD is a member, launched Vectopole Sud. This Montpellier network, which specializes in insects of medical, veterinary and agricultural interest, is the only one of its kind in Europe, and brings together five partners from research and higher education:

CIRAD, CNRS, INRA, IRD and the University of Montpellier, and EID Méditerranée, France's main public mosquito control agency.

Their goal: to build a French and European centre of excellence in the field of disease vectors and crop pests so as to improve prevention and control systems and thus preserve human, animal and plant health. ●

# Focus: Agroecology

Farming systems in the global South must adapt to climate, demographic, social and environmental challenges, and agroecology could be part of the solution, for all types of agriculture, to the issues raised by global change.

Agroecology has been a research priority for CIRAD for more than fifteen years now. In 2018, it was on the agenda at many international meetings, offering CIRAD an opportunity to give the scientific community and development players feedback on its experience and an overall analysis of its scientific operations in partnership in a wide range of situations in the global South over the past fifteen years.



## AGROECOLOGY IS A KEY TO MEETING THE CHALLENGES OF AGRICULTURE IN THE GLOBAL SOUTH

**In 2018, agroecology is high on CIRAD's agenda, giving the organization the opportunity to share experience and to undertake a comprehensive analysis of scientific actions conducted in many different contexts in the global South over the last ten years. This exercise has revealed the conditions required and the obstacles to overcome to achieve a successful agroecological transition.**



François Côte, Director of CIRAD's Performance of Tropical Production and Processing Systems Department

### Is agroecology the solution for the agricultural transition in the global South?

**F. C.:** In Southeast Asia, Madagascar and Africa, we have been working for more than ten years with AFD to test with our partners new production systems based on the principles of agroecology. This approach is a key factor in making food systems sustainable and addressing the many challenges of agriculture in the global South: climate change, population growth and urbanization, trade globalization, and threats to natural resources. In the South, these challenges are all the more serious given that state investment capacities and technical support are often inadequate.

### What are the key drivers of the agroecological transition?

**F. C.:** These drivers are not only biological but also organizational and institutional in nature. In the case of biological drivers, it is largely a matter of enhancing functional biodiversity and the associated natural regulation processes, maximizing biomass production, and fostering complementarity

between crop production and livestock breeding. But these technical approaches will struggle to emerge without organizational and institutional innovations capable of transforming production or processing systems. Public action is a crucial factor in the success of this transition. CIRAD's operations are intended, based on scientific evidence, to determine which biological mechanisms are being and should be used, what would facilitate innovation and foster impact in favour of producers and communities, the performance of new systems based on the concepts of agroecology and the different components of sustainability, and on different organizational levels.

Training and knowledge management are also crucial for the development of agroecology. The green revolution produced artificial systems through the use of chemical inputs, in the aim of boosting productivity, reducing the short-term economic risks, and simplifying crop management techniques to make them applicable everywhere, with a whole range of negative impacts.

Contrary to this model, which has shown its limitations, agroecological methods must serve to develop production systems that render a range of services (environmental, ecological, social, etc), in addition to the essential service of producing food. Those methods must also contribute to territorial development and, more generally, to the development of sustainable food systems.

In our research, we are seeking both to understand the influence of local conditions and to establish general rules applicable in different contexts and which underpin the success of the agroecological transition. To achieve this, CIRAD has a privileged position thanks to its close partnerships and its presence in many parts of the global South.

### With ten years of experience, are you able to pinpoint the conditions for the success of projects in favour of the agroecological transition?

**F. C.:** The key requirement is undoubtedly that of stakeholder participation: producers of course, but also the whole range of agricultural development and market players and public policymakers. These new systems need to be developed jointly through participatory approaches and negotiations between beneficiaries and users of the same resources and spaces. The agroecological transition will have many different forms and characteristics, and will be a gradual process.

### What are the major challenges ahead for research and development actors such as CIRAD and AFD?

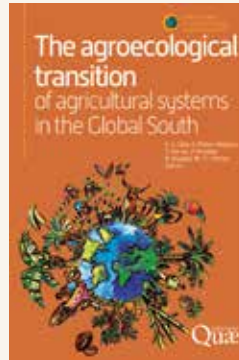
**F. C.:** A good deal of knowledge still needs to be developed. I am thinking, for example, of the functioning of soils or natural regulation mechanisms to control plant pests that mobilize biodiversity. Scale changes to deploy agroecology across large areas are another major challenge. In conventional agriculture, it is relatively simple to reproduce what is done at plot level on a much larger scale by increasing the resources and inputs used. This is not the case for agroecology, where systems are based on many different interactions, with numerous anticipated services that all compete with one another.

Agroecology is also more labour-intensive. What can be done to increase the efficiency of work, to make it less arduous, and to offer attractive jobs in agriculture? The agroecological transition must address these issues directly.

Strengthening our capacity to assess performance and trade-offs between services is also essential. Indeed, this is an

avenue of research in which CIRAD has invested heavily and will continue to do so in the future, via a range of performance indicators: yields, better standards of living for producers, environmental impacts, job creation, working conditions, ecosystem services provided at the territorial level, etc. We will increasingly have to "validate" them with production stakeholders and policymakers and be capable of articulating them across both space and time. The future of the agroecological transition in the global South depends of course on the policy support it receives on various organizational and political levels. The fact that FAO is promoting agroecology is undoubtedly a sign that things are changing, and CIRAD is contributing to this change and will continue to do so. We need to act fast! ●

## A CIRAD-AFD ebook on agroecology: *The agroecological transition of agricultural systems in the Global South*



Adapting farming systems in the global South to climate, demographic, social and environmental challenges is a necessity, and agroecology could be part of the solution, for all types of agriculture. This is the conclusion drawn by a book, *The agroecological transition of agricultural systems in the global South*, by 130 scientists from CIRAD, AFD and their partners. Agroecology centres on optimizing biological regulation processes, managing natural resources rationally, and recycling nutrients.

The book's authors identify two main types of drivers of the agroecological transition for farming systems in the South, and point out the substantial progress made in recent years, on two points:

- A technical driver: improving the performance of crop and livestock farming systems by regulating pest and disease attacks naturally and reducing pesticide use; and making more efficient use of natural resources (water, energy, soils, etc) to reduce chemical fertilizer applications and the risk of water pollution.
- An organizational driver: relying on existing dynamics to switch from a plot to a territory scale. The aim is to look at how to work together and the innovation support services required.

It is now essential to mobilize the authorities in order to accelerate this transition.

*The agroecological transition of agricultural systems in the Global South*  
Coordinated by François-Xavier Côte, Emmanuelle Poirier-Magona, Sylvain Perret, Philippe Roudier, Bruno Rapidel, Marie-Cécile Thirion.  
Editions Quae, 2019



"Healthy" vegetables on a market in Vietnam

© P. Moustier, CIRAD



Upland rice landscape, Madagascar

© J. Dusserre, CIRAD



Slurry pit, Burkina Faso

© M. Laurent, CIRAD



© CIRAD

The CIRAD stand at SIA

## CIRAD shines the spotlight on agroecology at the 2018 Paris International Agricultural Show

At the 2018 Paris International Agricultural Show (SIA), CIRAD again had a joint stand with the Agence française du développement (AFD), shining the spotlight on the issue of agroecology with regard to food security in the global South. During a conference, CIRAD and AFD shared their ten years of experience of the agroecological transition in the South, paving the way for the next stages in the transition. ●

## Cocoa: in response to climate change, agroecology is coming to the rescue

Contrary to rumours, chocolate is unlikely to disappear as a result of climate change. On two conditions, however: that we avoid the worst climate scenario, and that we adapt how we grow cocoa, using more drought-tolerant varieties and adopting more agroecological cropping techniques.

Agroforestry consists in associating trees with crops, either within existing forests or in specific plantings. It helps to restore soil fertility and regulate pests. Such systems are self-sufficient and do not require irrigation, other than rainwater. Agroforestry practices have made it possible to grow cocoa in zones previously considered unsuitable. In Cameroon, cocoa has been grown since the 1930s on grasslands, whereas it was originally an understorey tree in the Amazon rainforest.

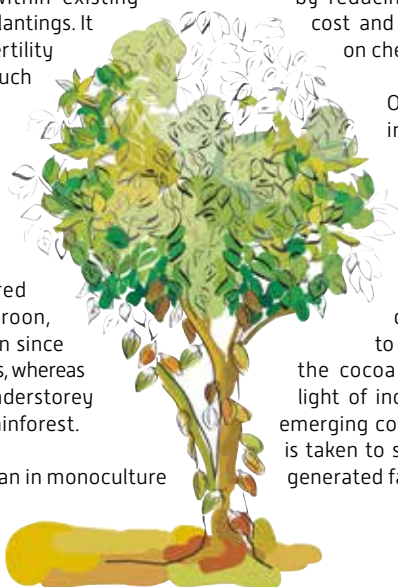
Yields are no lower than in monoculture systems, yet in the

1970s, productivist schemes abandoned this type of practice and switched to using chemical inputs and varieties bred to be grown in full sunlight, leading to deforestation and soil degradation.

Cocoa agroforestry systems are now making a comeback and have proved themselves in Cameroon and Latin America, by reducing the environmental cost and farmers' dependence on chemical inputs.

Other agroecological innovations are being developed, such as combining sheep farming with fodder trees in cocoa plantings in Ivory Coast.

These smallholder-led dynamics could serve to inspire other players in the cocoa supply chain, in the light of increased demand from emerging countries, provided care is taken to share the added value generated fairly. ●



F. Ribeyre © CIRAD

Cocoa tree covered with pods in a demonstration plot in Brazil



# 2018 indicators

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This analysis reflects CIRAD's activities through specific indicators that are in keeping with the 2014-2018 Contractual Objectives and with CIRAD's key ambitions set out in its Strategic Vision 2012-2022:

**Ambition 1 :**

To serve as a global reference for our scientific priorities

**Ambition 2 :**

To co-build strategic agricultural research for development partnerships

**Ambition 3 :**

To establish the conditions for effective innovation

**Ambition 4 :**

To evolve in order to achieve our ambitions

## THE AMBITION OF SHARING SCIENCE TO MEET THE CHALLENGES FACING THE COUNTRIES OF THE GLOBAL SOUTH

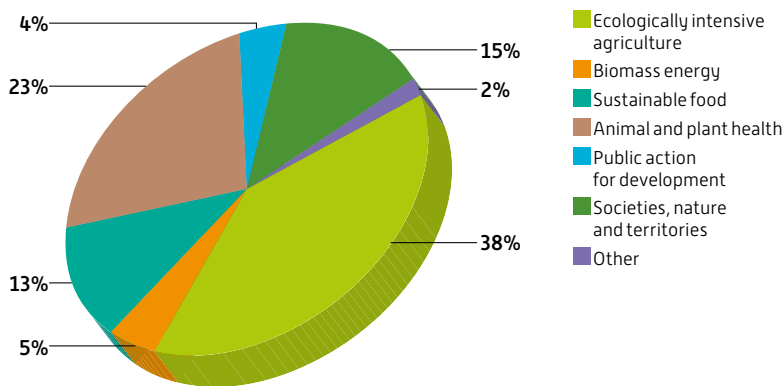
CIRAD's priorities, expressed via the six strategic lines of research set out in the 2014-2019 Scientific and Partnership Strategy Objectives (SPSOs), are largely reflected in its scientific output in terms of publications.

The distribution of articles varies very little between years: **Ecologically intensive agriculture** is CIRAD's line of research that generated the highest number of publications in 2018 (482 publications, 38% of the total annual volume), followed by **Animal and plant health** (289 publications, 23% of the total).

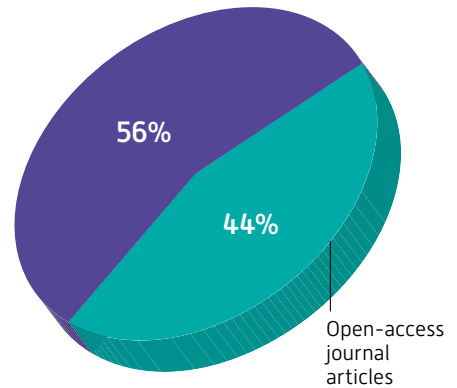
Sharing science also means open access: nearly half of the peer-reviewed journal articles (44%) published by CIRAD in 2018 are freely accessible online.

### Distribution of 2018 publications by line of research

Publications concerned: journal articles, books and book chapters, conference proceedings, PhD theses and dissertations, patents



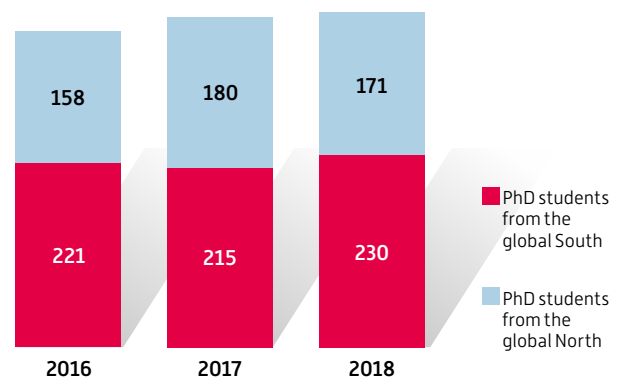
### Proportion of articles published in open-access peer-reviewed journals



The number of PhD students supervised by CIRAD has remained steady, while over half of the students (57%) are from countries in the global South.

Year	Proportion of PhD students from the global South out of the total
2018	57%
2017	54%
2016	58%

### Supervision of PhD students by CIRAD researchers





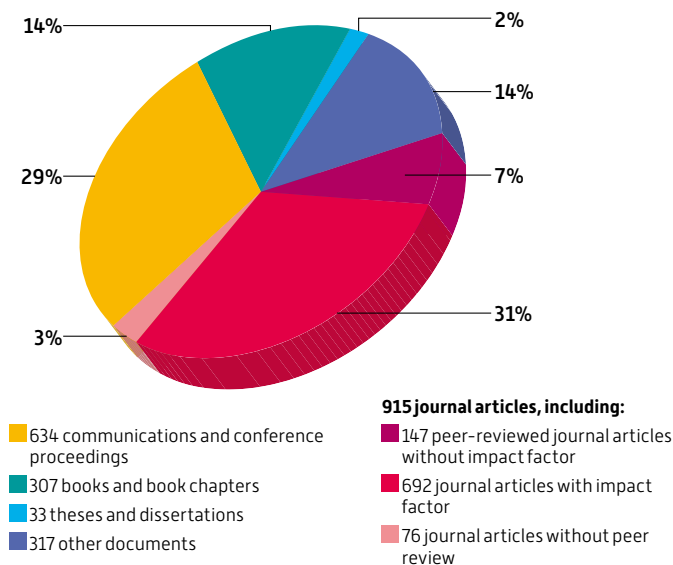
## DIVERSIFIED, HIGH QUALITY SCIENTIFIC OUTPUT

CIRAD's efforts to improve the quality of its scientific publications, ensure scientific recognition of its teams and broaden the range of its outputs so as to reach different audiences are reflected in the results presented in this section. CIRAD is continuing to work with its partners in the Global South and throughout the world to ensure academic recognition of development-oriented science supported by field studies and co-designed participatively with its partners in the South — these are core objectives in CIRAD's mandate.

Journal articles accounted for a major proportion (41%) of CIRAD's 2018 publications, followed by communications and conference proceedings (29%).

### Distribution of 2018 publications by document type

Journal articles, books and book chapters, communications and conference proceedings, theses and dissertations, other documents



Source: Agritrop. Dist – DGD-RS – as of 29/04/2019

### Research training for CIRAD's scientific staff

The trend regarding the number of research directors has generally been rising, highlighting that many researchers are now gaining academic recognition for their work.

	2016	2017	2018
Number of HDRs* at CIRAD	172	178	188

\*Research directors with accreditation to supervise research

Source: SIRH. DGD-RD

### Outreach: patents, brands, proprietary variety protection certificates and software

The number of patents, brands, software packages and proprietary variety protection certificates has remained steady over the year.

	2017	2018
Number of applications for patents, brands, proprietary variety protection certificates and software	7	7
Resulting number of patents	1	3

Source: Dims – DGD-RS

## NATIONAL AGRICULTURAL RESEARCH OPEN TO EUROPE AND THE REST OF THE WORLD

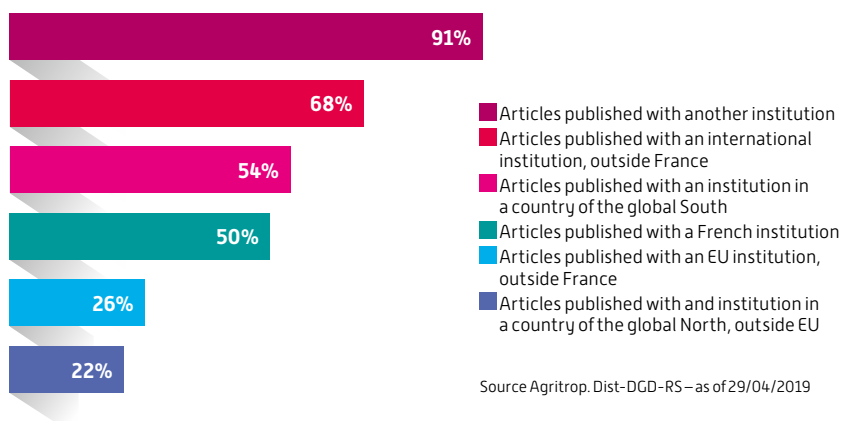
A majority (91%) of articles published by CIRAD in 2018 are co-publications\*. 68% of the articles include at least one co-author from an international institution\*\*, while over half (54%) include an author from the global South\*\*\*.

\* An institution is credited with one unit for a CIRAD publication when one or more of its authors are co-authors of the publication

\*\* An international institution is an establishment located outside France

\*\*\*Countries of the global South are those included on the OECD DAC List of ODA Recipients: [www.oecd.org/dac/financing-sustainable-development/development-finance-standards/daclist.htm](http://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/daclist.htm)

### CIRAD co-published peer-reviewed journal articles in 2018



The number of senior staff overseas postings remained steady at 315 in 2018 as compared to 2017. There was little change in the distribution in major regions: most senior

staff members were posted in the French overseas departments and regions (DROM) and sub-Saharan Africa. The distribution of missions according to destination varied

little between years, with most taking place in sub-Saharan Africa, metropolitan France and Asia.

### Distribution of senior scientific staff overseas postings according to destination [in full-time equivalent] in 2018

Sub-Saharan Africa	96
North Africa	11.3
Asia	35
Oceania	1.5
South America	28.6
Central America and Caribbean	13.7
North America	1.1
French overseas regions	122.6
Other	5.4
<b>TOTAL</b>	<b>315.1</b>

Source: SIRH. DGD-RD

### Distribution of salaried staff missions according to destination [in full-time equivalent] in 2018

Sub-Saharan Africa	24
North Africa	1.9
Asia	10.7
Oceania	1.1
South America	5.6
Central America and Caribbean	2.8
North America	2
French overseas regions	7.9
Europe	4.9
France	11.9
<b>TOTAL</b>	<b>72.8</b>

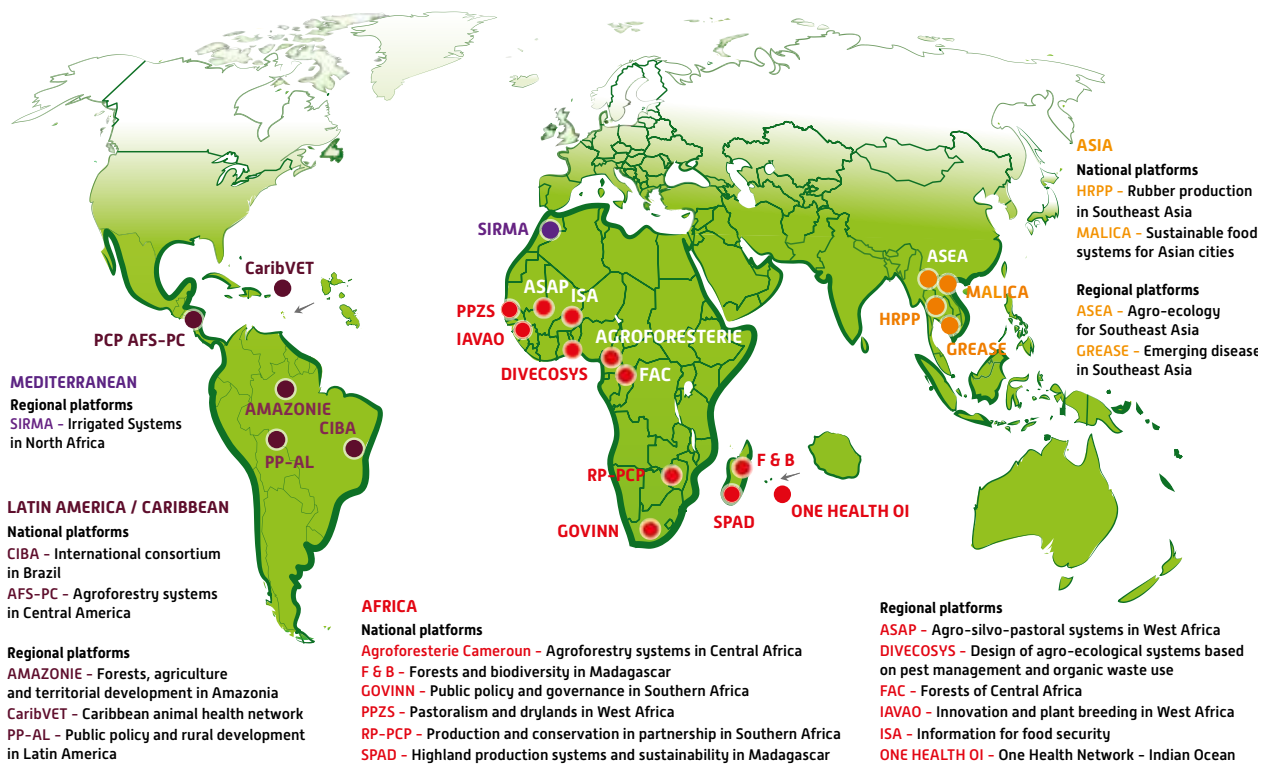
Source: SIRH. DGD-RD

## Number of CIRAD senior scientific staff members on assignment, or on assignment in platforms in partnership (dPs), or in the French overseas departments and regions (DROM) (in full-time equivalent) in 2018

No. of scientific staff members on assignment	315
No. of scientific staff members on assignment in dPs	126
No. of scientific staff members on assignment in DROM	122.6

Source: SIRH, DGD-RD.

## Platforms in partnership for research and training (dPs)



## CIRAD's EU research and development projects (FPs)

Despite the extremely competitive European environment, CIRAD's success rate remains above the average for Europe (12%). After a sharp increase in the number of project submissions, the annual number of proposals decreased to about 20 in 2018, with an exceptionally high success rate (over 50%).

	2017	2018
Number of projects submitted	29	17
Number of projects funded	4	9
Success rate	14%	53%
Number of projects coordinated by CIRAD	1*	3 including 1*

\*Marie Curie grant, non-collaborative project

Source: Europe Office, DGD-RS, CIRAD

## A STRUCTURE AND RESOURCES TAILORED TO NEW CHALLENGES

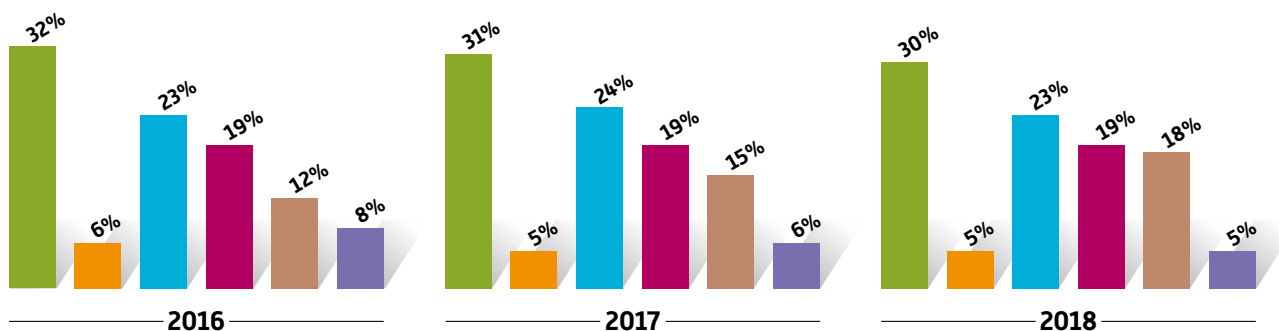
The work undertaken by CIRAD, as part of a proactive strategy of developing contractual resources to consolidate its economic model, and the intensive efforts of its staff to boost the organization's contractual resources are reflected by the overall increase in contractual activity. CIRAD's 2018 accounts show a surplus of

€0.4 million after six consecutive years of deficit.

The renewed dynamism in contractual activity is reflected in the much higher level of profitability on contracts than observed in recent years. Moreover, new orders booked in 2018, which will determine future revenues and margins, are also reaching

historically high levels. Note that the current order book does not yet include a number of major contracts that should be signed in 2019, particularly all Desira projects currently being launched with the EC Directorate General for International Cooperation and Development (DG Devco) and the French Development Agency (AFD).

### External resources generated by CIRAD: amount and annual breakdown as a percentage (excluding joint contracts)

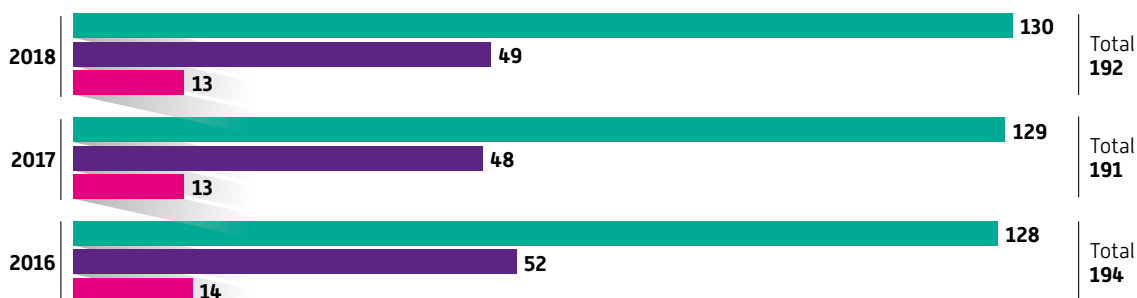


Source: Dcaf, DGD-RD

### Origin of contractual funding

■ Private funding 
 ■ French overseas collectivities 
 ■ EU structural and investment funds 
 ■ French public funding 
 ■ Foreign public funding 
 ■ EU research and development funds

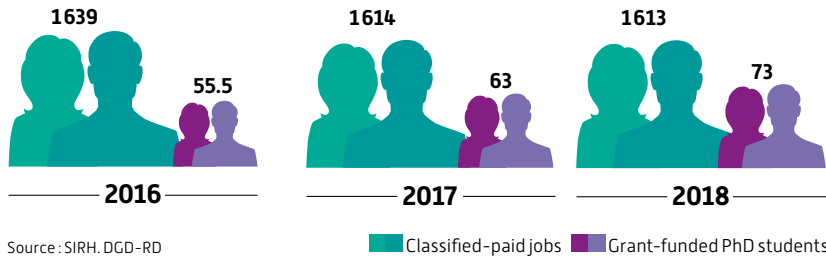
### Operating costs, excluding internal subcontracting (in € million)



Source: Dcaf, DGD-RD

■ Staff 
 ■ Operating costs 
 ■ Other costs

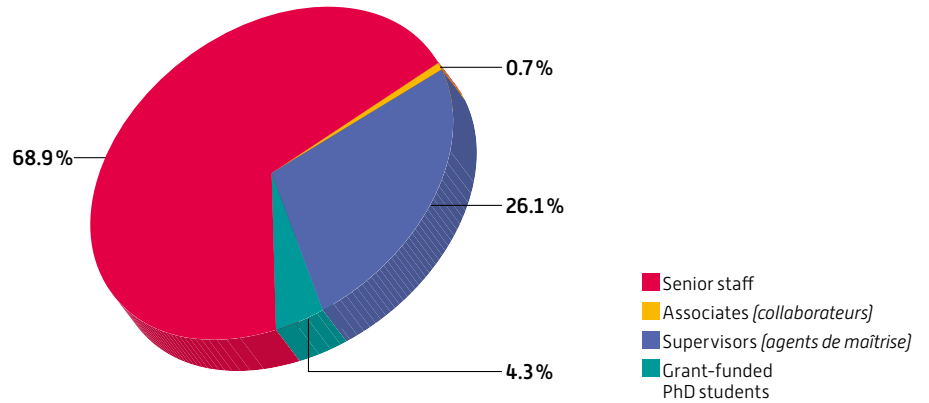
## Total CIRAD staff numbers



Over the last three years, there has been no major change in job structure, with 93% permanent contracts, 3% fixed-term contracts and 4% grant-funded PhD students. The major change concerns staff numbers, with a regular reduction in the number of permanent contracts and in the number of classified-paid contracts since 2014.

## Annual breakdown of classified-paid jobs (%) per category in 2018

The proportion of senior staff increased slightly compared to 2017 (68.2%). The proportion of grant-funded PhD students remained steady, while the proportion of supervisors declined slightly (27.3% in 2017).





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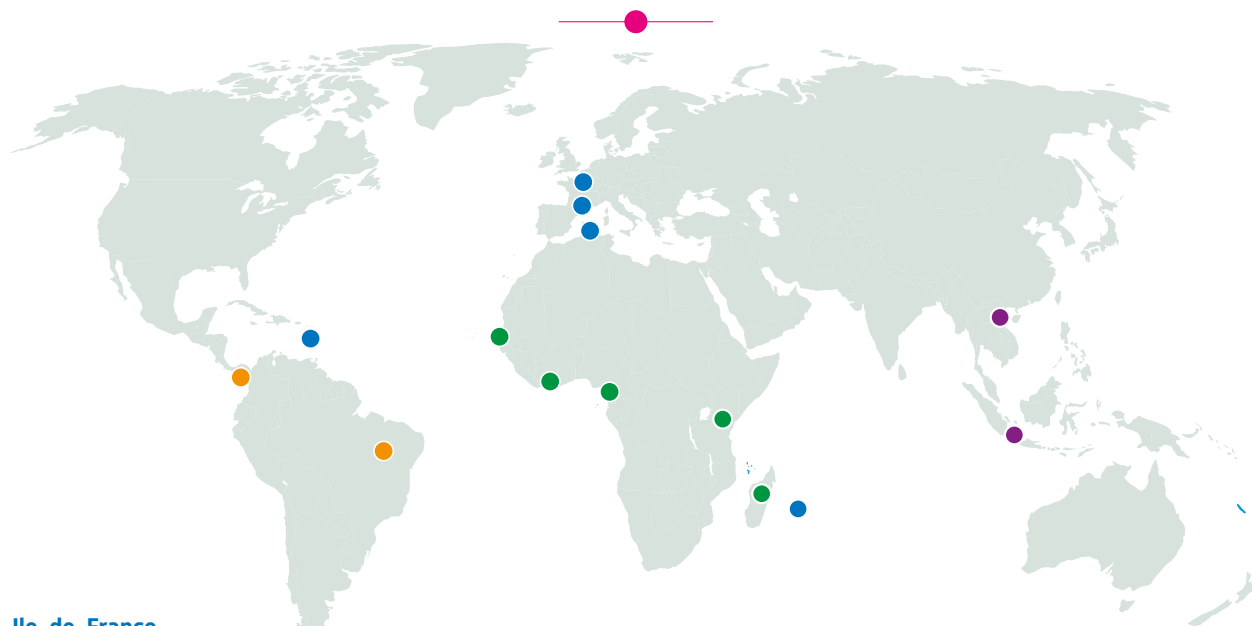
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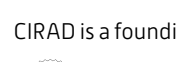
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