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AGRICULTURAL RESEARCH FOR DEVELOPMENT

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Annual report 2024

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Publication manager
Élisabeth Claverie de Saint Martin, CIRAD CEO

Editorial coordination
Anne Perrin, CIRAD Communication Office

Translation
Helen Burford Buttazzoni, CIRAD Communication Office

Drawings
Delphine Guard-Lavastre, CIRAD Communication Office

Production/layout
Patricia Doucet, CIRAD Communication Office

Disribution
Marie Perrin, CIRAD Communication Office

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A word from our partners

Throughout 2024, CIRAD celebrated its 40th anniversary in its current form. In addition to looking back at its history, the organization seized the opportunity to take stock of the main challenges facing future agricultural research and farming systems. An event held in the Le Monde newspaper's amphitheatre in Paris on 25 November attracted a large number of partners keen to discuss "Feeding ten billion people by 2050: challenges and solutions". It was a chance to hear from three eminent partners: **Dao The Anh,** Vice-President of the Vietnamese Academy of Agricultural Sciences and Chair of the MALICA platform in partnership for research and training; **Oumar N'Diaye,** Executive Director of the Fonds interprofessionnel pour la recherche et le conseil agricoles in Ivory Coast (FIRCA); and **Ibrahim Assane Mayaki,** Executive Secretary of the New Partnership for Africa's Development (NEPAD) Planning and Coordinating Agency.

Dao The Anh

What is the history of your partnership with CIRAD and what main topics does it cover?

CIRAD was ten years old when it arrived in Vietnam, and has therefore been working with our country for a long time. It all began in the mountains, with CIRAD supporting sustainable farming practices to fight drought, including promoting conservation agriculture. Our cooperation has produced significant results, particularly for the development of aquaculture, such as the introduction of catfish fingerlings, which resulted in a major export sector for Vietnam. Since 2002, our cooperation with CIRAD has shifted to focus on socioeconomic aspects and linkages between the rural world and markets. The MALICA platform in partnership for research and training set up at that time now has 20 years of work under its belt. It is more than just a "project", since projects are often too short-term, and has enabled a range of different partnerships. To give just one example, MALICA is working to build short value chains linking periurban areas and cities. Research has a major role to play in providing scientific evidence and fuelling policy discussions, for instance the work done in 2021 to participate in the international dialogue on changes in food systems. The advent of the "One Health" concept has also been a remarkable development, with new partnerships in a range of fields, encompassing animal, plant, human and environmental health, and agroecology.

> "One of the strengths of our cooperation is the long-term presence of French scientists on the ground.

What are the partnership's strong points?

The cooperation between CIRAD and Vietnam has followed the country's political priorities. Vietnam has been keen to make a radical change and switch from intensive agriculture to agroecology and One Health. One of the strengths of our cooperation is the long-term presence of French scientists on the ground. This ensures increased knowledge, a better understanding of changes in the country's political and cultural situation, and greater reactivity. It is nevertheless regrettable that there are not more human and financial resources available, in view of the extent of current demand and expectations in terms of agricultural research. ■

Oumar N'Diaye

What are the key points of the partnership between FIRCA and CIRAD in Ivory Coast?

The partnership between CIRAD and FIRCA began in 2014 with a contract for a feasibility study on genetically modified cotton.

Since then, we have signed nine contracts for studies and projects covering a wide range of topics relating to value chains like coconut, oil palm, rubber and dessert banana, and the dissemination of innovations for the cocoa and forestry chains. In all, in ten years, our collaboration has resulted in ten formal contracts for a total of almost a million euros.

The projects conducted have addressed important issues for Ivorian agriculture, notably the feasibility of genetically modified cotton; biological control of mealybugs in cocoa plantings; an assessment of dessert banana cropping techniques; the environmental impact of rubber and oil palm; promotion of mixed planting to produce wood and energy; coconut products and their uses; and banana fusarium wilt (TR4).

Our partnership has had significant impacts. With CIRAD, we have helped to strengthen agricultural research in Ivory Coast, introduced new techniques and innovations, and organized training for local farmers and researchers. These initiatives have boosted our knowledge of the value chains concerned.

> "Our partnership has had significant impacts. With CIRAD, we have helped to strengthen agricultural research in Ivory Coast.

What are the prospects for the partnership?

Things are looking good. We signed a second agreement during CIRAD's 40th-anniversary year, marking our determination to continue to collaborate and adapt our objectives to the challenges currently facing agriculture. We are planning to pool our efforts to obtain funding for research and to disseminate innovations in Ivory Coast.

We are also planning to build new research and innovation projects to support agricultural value chains and to extend our collaboration to other local and international partners. Lastly, we shall be setting up monitoring and evaluation mechanisms to measure the impact of our projects and adjust our strategies accordingly.

Our partnership will continue to play a major role in agricultural development in Ivory Coast, by providing innovative solutions and building local capacity. ■

Ibrahim Assane Mayaki

What is the most important type of research for more sustainable food systems, to feed ten billion people by 2050?

There is the fundamental research that we already know, which provides science and allows us to look into micronutrients, soil quality, and adaptation to climate change. This science, which generates instruments we can make concrete use of, is absolutely vital. But there is also a second level, closer to action research, which relies on interactions with grassroots players who themselves have knowledge to share. CIRAD is really good at that type of research, it works with local players to help them protect their crops and boost yields, in line with the principles of agroecology. I'm convinced that this aspect of research is just as important as fundamental research. Lastly, research needs to act on a third level, that of political messaging… The issue is how to make sure research reaches ministers, prime ministers and governments. I'm afraid we're lagging behind in this respect. And the only way of making up that shortfall is to set up a forum for dialogue and consultation, beyond national discussions about agricultural research centre budgets. That forum needs to go a lot further and foster fundamental interactions between civil society, politicians and scientists.

> "As a global player, CIRAD can facilitate exchanges across continents and between regions, and this is a unique skill.

How can CIRAD and other research organizations help tackle these challenges?

As I see it, CIRAD has three advantages. Firstly, as a global player, it can facilitate exchanges across continents and between regions, and this is a unique skill: as far as I know, few institutions have the potential to do this. The second advantage is that it trains scientists on every continent. This provides a bridge, or a local relay point, to transform practices and policies. Lastly, CIRAD's third advantage, in my mind, is its ability to pass on what scientists have to say on a global level, beyond the national, regional or local scale, to ensure a global impact within the frameworks, mechanisms and the global system in which we operate, which are not always in the best of health. This is therefore a valuable asset. ■

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Élisabeth Claverie de Saint Martin, CIRAD CEO

EDITORIAL

A positive year overall, despite unprecedented challenges

The year 2024 was marked by many challenges, but also by many successes, in terms of both our scientific projects and our international commitments.

Sound, innovative scientific results

We have succeeded in sustaining quality scientific operations, characterized by their relevance and innovative nature. In collaboration with other organizations in France and Europe, we have been able to build ambitious projects under the umbrella of the EU research and innovation initiative Horizon Europe. These collective achievements are proof of CIRAD's ability to address global issues, from the ecological transition to food security, working at grassroots level in tropical and Mediterranean countries. Our success is also the result of our methodological rigour, illustrated by the publication of our 2024-2028 Scientific and Partnership Strategy Objectives, which will frame our future scientific operations.

Stronger international partnerships and an unfailing commitment to the French overseas regions

International partnerships were another strong point in 2024. Although we face a number of complex geopolitical situations, we have succeeded in sustaining our links with our African partners, notably in Burkina Faso, while strengthening our presence in East and southern Africa, Latin America and Southeast Asia. These successes are the fruits of the trust built thanks to our collaborative approach and respect for local cultures. 2024 also saw us strengthen our commitment to the French overseas regions, centring on working together to build innovative, inclusive and sustainable solutions to ensure impact and concrete benefits on the ground. Our exceptional reaction to the cyclone in Mayotte was the perfect example of our solidarity, and showed just how rooted CIRAD is in those regions.

40 years: a tribute to partnerships and working together

2024 was CIRAD's 40th anniversary year, a chance for us to showcase our long-term operations. Through a number of events in mainland France, the overseas regions, Brussels and elsewhere, via our regional offices worldwide, we were able to reaffirm the importance of our role in agricultural research for sustainable development. Those events were a huge success, and underlined the degree to which our partners and line ministries recognize the quality of our work. The highlight of the celebrations, a major public conference organized in partnership with *Le Monde* on the topic of "Feeding the planet in 2050", packed out the newspaper's amphitheatre in Paris.

The year 2025 is set to be a complex one, due to the current national budget uncertainty, but we have good cause to remain optimistic. We shall continue to work to build quality scientific projects, while strengthening our international partnerships. CIRAD has always managed to anticipate change and reinvent itself in response to global issues. We are determined to stay true to our remit to support sustainable agriculture and development in tropical and Mediterranean countries. Together, we have the necessary means and collective spirit to tackle future challenges. We can look forward to 2025 with confidence. ■

Highlights

January

RFL4: 4th Rencontres francophones légumineuses

RFL4 was a unique opportunity to compare views, share knowledge and boost innovation in terms of legumes, from 22 to 24 January 2024 in Dakar-Saly (Senegal). The event was organized by CIRAD, INRAE, Terres Inovia and Terres Univia, with support from the Institut sénégalais de recherches agricoles (ISRA) and IRD, and brought together development, value chain, and legume research players.

February

Young people and diet

For its 13th annual symposium at Institut Agro, Montpellier, on 2 February, the UNESCO Chair in World Food Systems looked into the relations between young people (15 to 30-year-olds) and their diet. Symposium organized with support from CIRAD.

Women and girls in science

For the International Day of Women and Girls in Science on 11 February, CIRAD released a photo report following four women agronomists, a fascinating journey to Kenya, Ivory Coast, Senegal and Brazil.

Spotlight on soils

As the International Decade of Soils drew to a close, the topic for the Agence Française de Développement (AFD) group-CIRAD stand at the Paris International Agricultural Show from 24 February to 3 March 2024 was "Soils and land, life in our hands" (see special report on soils, wwp. 11).

March

Collective intelligence for action

The Montpellier Process, launched in early 2021, brought together the scientific community on 19 and 20 March 2024, inviting a broad coalition of partners working for sustainable, equitable and fair development. Event organized by the University of Montpellier and CGIAR. In partnership with and with the participation of CIRAD.

April

CID 2024: 4th Sustainable Intensification Conference

This unmissable event on agroecology in West Africa was held from 23 to 25 April 2024 in Dakar, Senegal. Organized by ISRA, DyTAES, IRD and CIRAD. Scientists, students, experts and professionals met to present their latest scientific results and discuss the challenges and opportunities for sustainable agriculture in sub-Saharan Africa.

May

Africa Fertilizer and Soil Health Summit

The Africa Fertilizer and Soil Health Summit, organized by the African Union, was held from 7 to 9 May 2024 in Nairobi (Kenya). CIRAD and its Agrinatura partners organized a side event in collaboration with FAO and the European Union, on "Using fertilizers in agroecological approaches in Africa"


© R. Belmin, CIRAD

June

5th International Vanilla Symposium

The 5th International Vanilla Symposium, organized by the University of Réunion and CIRAD, was held from 4 to 7 June in Saint-Pierre, Réunion. Some 60 scientists from 20 countries met to discuss the future of vanilla and the crucial issues facing the spice in an ever-changing world.


In the absence of pollinating insects, vanilla flowers are hand-pollinated. This operation is known as "marriage"
© R. Carayol

CIRAD's 40th anniversary celebrations are go!*

The celebrations for CIRAD's 40th anniversary began on 25 June in Montpellier, with a photographic exhibition open to the general public at the city's botanical gardens and an event to bring together partners and staff members, at the Corum centre. This gave CIRAD a chance to report on the impact of its research in partnership with countries in the global South, in the fields of agriculture, environment and health.

Watch the replay

* There were many events celebrating CIRAD's 40th anniversary in 2024. Only a selection is presented here.

DeSIRA Connect Days

Latin America and Caribbean

This event, organized in Bogota (Colombia) from 25 to 27 June, marked the start of a cycle of three events aimed at sharing the lessons drawn from implementation of the DeSIRA projects and identifying the conditions for the pursual of their innovation pathways in three world regions. CIRAD took part in all three events.

Highlights

July

DeSIRA Connect Days
Eastern and Southern Africa

CIRAD took part in the DeSIRA Connect Days – Eastern and Southern Africa, from 29 to 31 July in Kigali (Rwanda). Organized in close collaboration with the Forum for Agricultural Research in Africa (FARA), during the Science and Partnerships for Agriculture Conference.

September

CIRAD's 40th anniversary

Central Africa

To mark the organization's 40th anniversary, its regional office for Central Africa organized a roundtable on 17 September on the topic of shared research to grow the world of tomorrow in central Africa.

Brazil and Southern Cone countries

Several events were organized to mark CIRAD's 40th anniversary, in partnership with the Alliances françaises (French Councils) in the cities of Brasília, Fortaleza and Belém. To begin with, a ceremony and the official opening of the magnificent photographic exhibition "Préserver la planète : le vivant grand format" on show from 23 September in Brasilia until 13 December in Belém. Informal scientific meetings were also organized, with the screening of the film "Amazonie brésilienne, un autre regard".

DeSIRA Connect Days
Western Africa, Central Africa and Madagascar

The third DeSIRA Connect Days event in 2024 was held in Accra (Ghana) from 24 to 26 September, with the active participation of CIRAD.

October

Sommet de l'élevage

During the 2024 Sommet de l'élevage in Clermont-Ferrand (France) from 1 to 4 October, CIRAD took part in a roundtable broadcast live on YouTube, on West and central African dairy and meat markets.

© J.-D. Cesaro, CIRAD

CIRAD's 40th anniversary

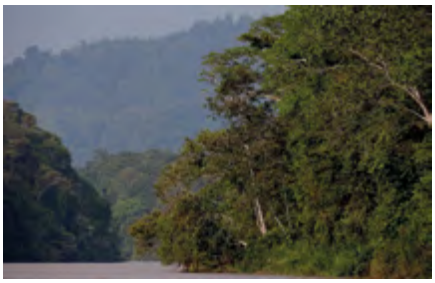
Southeast Asian islands

The CIRAD regional office for Southeast Asia and the Institut français in Indonesia celebrated CIRAD's 40th anniversary on 8 October in Jakarta (Indonesia). The programme included a half-day conference-debate on the installation and evolution of coffee and cocoa value chains in Indonesia, a roundtable on food recycling, coffee and chocolate tasting sessions, and a large-format photographic exhibition. The celebration was part of a month of events focusing on food, organized by the Institut français in Indonesia.

Harvesting coffee by hand in Kintamana, Bali (Indonesia) A. Rival © CIRAD

SALSA, a platform in partnership for sustainable agricultural landscapes in Southeast Asia

A new platform in partnership, Sustainability of Agricultural Landscapes in Southeast Asia (SALSA), was officially launched on 14 October 2024 in the Philippines. This ambitious collective project aims to provide a better understanding of the landscape mosaic in the Southeast Asian island countries (Malaysia, Indonesia, Philippines), a region that still boasts a wealth of biodiversity.



Kinabatangan River (Sabah, Malaysia) A. Rival © CIRAD

One Health in action conference

An international conference – "One Health in action: supporting and accelerating the bridging of the vertebrate and plant health communities" – was held in Montpellier from 14 to 17 October 2024. This major scientific event highlighted the challenges posed by vector-borne diseases, which are a growing threat to human, veterinary and plant health worldwide.

SIAL International Food Show

CIRAD took part in the 60th SIAL International Food Show at Paris Nord Villepinte from 19 to 23 October. It was a SIAL partner and co-organizer of the SIAL African Food Summit.

Biodiversity COP16

CIRAD took part in COP16 in Cali (Colombia) from 21 October to 1 November, as an observer of the talks and co-organizer of events with its partners from France, Europe and the global South. This was an opportunity for it to share its major research results with policymakers and other COP participants.

Highlights

November

Climate COP29

CIRAD took part in the 29th UN Climate Conference in Baku (Azerbaijan) from 11 to 22 November.

© COP29

High-Level Forum on Livestock and Pastoralism in the Sahel and West Africa

The Nouakchott+10 Forum, organized by CILSS and the World Bank, with the participation of CIRAD, and held from 11 to 22 November in Nouakchott (Mauritania), set out to assess the results of the implementation of the 2013 Declaration aimed at making livestock farms in the region more resilient and more productive.

© S. Taugourdau, CIRAD

CIRAD's 40th anniversary

Southern Africa and Madagascar

The highlight of CIRAD's 40th anniversary celebrations in Madagascar was a photographic exhibition, "Les 40 ans du CIRAD à Madagascar", on show at the Alliance française (French Council) in Antananarivo during the Science Festival from 13 to 15 November. Among others, the exhibition attracted a number of science students and teachers from several establishments in the capital.

West Africa-Dry Zone

CIRAD's regional office celebrated the organization's 40th anniversary from 19 to 22 November 2024 in Dakar (Senegal), alongside two of its partners – the Institut sénégalais de recherches agricoles (ISRA) and the Institut de recherche pour le développement (IRD) – that were celebrating their 50th and 80th anniversaries respectively.

How can we feed 10 billion people without destroying the planet?

To mark its 40th anniversary, CIRAD organized two events in partnership with the *Le Monde* newspaper, on 25 November in Paris. One was a conference open to the general public, which set out to answer the question "how can we feed 10 billion people by 2050 without destroying the planet?". Speakers included author and member of the Académie française Erik Orsenna.

MOOD project closing conference

To mark the completion of the H2020 MOOD project, CIRAD and the Istituto Superiore di Sanità (ISS) co-organized an international conference in Rome (Italy) on 26 and 27 November, on emerging infectious diseases in Europe.

December

Desertification COP16

CIRAD took part in the 16th Conference of the Parties (COP16) of the United Nations Convention to Combat Desertification (UNCCD), from 2 to 13 December in Riyadh (Saudi Arabia). It was there to promote pastoralism as a crucial lever for land restoration and sustainable natural resource management.

CIRAD's 40th anniversary

Continental Southeast Asia

To mark its four decades of research in the global South, CIRAD launched a travelling exhibition in continental Southeast Asia. After its inauguration in Montpellier's botanical gardens in June, the exhibition, which showcased CIRAD's contributions to the agroecological transition, biodiversity preservation, One Health and resilient food systems, was on show in Bangkok (Thailand), Phnom Penh (Cambodia), and Vientiane and Hanoi (Vietnam), between October and December 2024.

© L. Vo, CIRAD

© CIRAD, J. Queste

Domesticating voatsiperifery

Madagascan wild pepper is endemic to the island, and is considered to be one of the best peppers in the world. Voatsiperifery became popular some 15 years ago. The fact that it is so difficult to pick has not saved it from over-exploitation, which also destroys forests. CIRAD and FOFIFA are working with pickers to grow the vine.

The Réunion integrated natural environment conservation and restoration project wins an ecological engineering prize

The Réunion integrated natural environment conservation and restoration project and the players involved have been awarded the Prix national du Génie Écologique 2024 (2024 national ecological engineering prize), organized by the Association fédérative des acteurs de l'Ingénierie et du Génie Écologique (A-IGÉco) and the Office français de la biodiversité (OFB), in the category for management practices that foster biodiversity. By pooling both knowledge and resources, the project has multiplied the possibilities of restoring natural environments in Réunion.

© M. Dailloux, CIRAD

Rural communities adapting to water shortages

In Brazil and Tunisia, people in semi-arid zones are adapting to worsening water shortages by means of individual and collective innovations. To mark World Day to Combat Desertification and Drought in June, CIRAD published a series of images of just some of the thousands of ways such communities are adapting and building a path between resilience and solidarity. Examples from the SERTÕES project in Nordeste, Brazil, and the PACTE project in Tunisia.

More sustainable cotton

Benin is the leading producer of cotton in Africa. The sector accounts for 30% of the country's exports and provides livelihoods for more than 300 000 households. But the downside is that the intensification of this crop is depleting soils, with two thirds of land in Benin now moderately or highly degraded. To restore healthy soils and ensure the sustainability of the cotton sector, the government of Benin is turning to agroecology.

© P. L. Yemadje, CIRAD

© T. Teixeira Da Silva Siqueira, CIRAD

The "niébétruck", an innovation to benefit food security

To support female small-scale cowpea processors in Benin, a team of scientists has created a mobile fritter production and sales unit. The first prototype of the "niébétruck" (cowpea truck) was co-designed with local women and a local equipment maker. The innovation, which allows the women to make and sell cowpea fritters, is safe, mobile and practical, and makes their job less difficult.

Local information is crucial for monitoring avian influenza foci worldwide

A study published in the journal PLOS ONE highlights the way in which event-based surveillance (EBS) tools for early detection of avian influenza foci worldwide monitor various online sources to glean information at an early stage, in addition to that provided by health agencies, in terms of animal disease foci. Some 75% of the foci detected early on were pinpointed using data from local sources.

A. Rival © CIRAD

Focus

Save our soils

Save our soils

Soils are essential for our subsistence, and play a crucial role in the lives of human communities worldwide. However, they are under threat, as a result of both human activities and climate change. CIRAD is working on research aimed at restoring and protecting soils, and in 2024, its stand at the Paris International Agricultural Show showcased its many projects on soils. We take a look back…

According to the Association française pour l'étude des sols' definition, soils are the result of rocks breaking down under the effects of climate, relief and living organisms, make up the Earth's "epidermis" and should be seen as a non-renewable resource, on a human level. This highlights a crucial issue: while soils are indeed the Earth's epidermis (in which case, how can we do without them?), they are non-renewable on a human level and we must therefore protect them. CIRAD is pulling out all the stops to this end.

© R. Belmin, CIRAD

A range of functions

CIRAD's research on soils has given it in-depth knowledge of these environments, which have many functions. They include that of a habitat: soils have the capacity to support organisms and help conserve ecosystem diversity, species diversity and genetic diversity. They also have a vital productive function: they produce biomass in the form of food and fodder crops, wood and fibres. Their role as an archive, thanks to their capacity to store information on natural and cultural history, is of major importance for research. Furthermore, soils are also a source of raw materials: they store water, geothermal energy and carbon, among other things. Soils, excluding permafrost, contain three times as much organic carbon as the atmosphere. They are the world's largest terrestrial carbon reserve, with stocks largely concentrated in forest and rangeland soils, making them a major lever for adapting to the effects of climate change.

Soils in danger

At present, 95% of the nutrients in our food come from the soil. However, its capacity to continue feeding humanity is under a dual threat, from human activity and climate change. Several types of degradation are involved, from artificialization to erosion, pollution, and salinization, among others. Some 75% of the Earth's land mass is already degraded, and the subsistence of more than a billion people is at risk worldwide. Soils take a relatively long time to react to external influences, hence by the time problems are detected, it is often already too late. It is in soils that harmful and toxic products end up, which explains why chemical damage is often permanent and why an intact structure is the only way of guaranteeing soil functioning. In addition to chemical pollution, land use changes are a major source of net greenhouse gas emissions. Over the past six decades, almost a third of the world's land area has seen land use changes. Converting natural ecosystems to agriculture has triggered a 116-billion-tonne total loss of carbon from the top two metres of soil, and the effects of land use changes on soil organic carbon are seven to ten times greater than the direct effects of climate change.

Land tenure is also a cause for concern. Access to land is vital for crop and livestock farmers, both for their own livelihoods and to satisfy the global population's requirements. However, there are substantial inequalities in terms of access to land across the world. The largest 1% of farms cultivate 70% of the world's agricultural land, while other farmers, striving to safeguard their own jobs and food security, who make up the vast majority, farm just 12% of it.

Protecting soils

CIRAD has two main, complementary approaches as regards soil research. On the one hand, a territory-based approach, and on the other, one that involves a range of agroecological practices. It mobilizes numerous scientific disciplines, including human and social sciences.

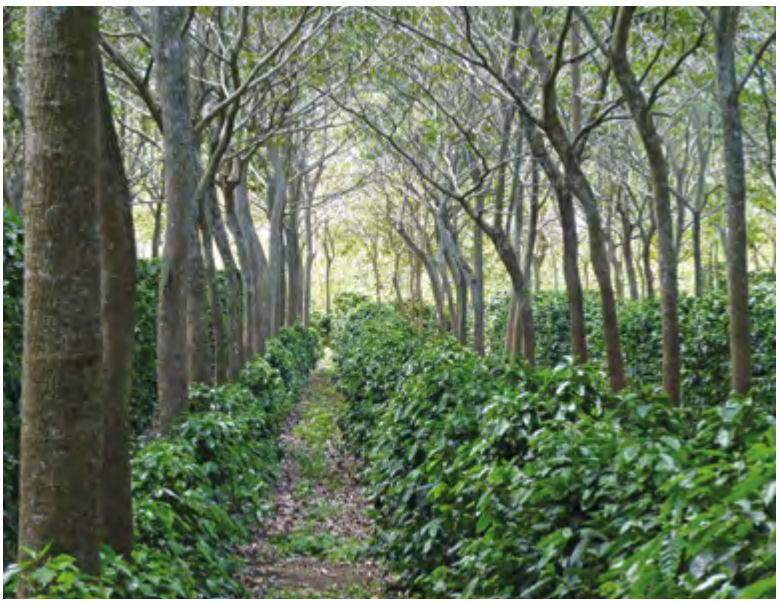
The territory-based approach serves to consider a territory in its entirety. One example is the TerrAmaz programme in support of Amazon territories, which combines territorial management, land use planning and land use changes in five territories across Brazil, Colombia, Ecuador and Peru. Along the same lines, the Terri4Sol project works to provide decision makers with scientific elements to enable them to build land

use scenarios that foster organic carbon storage in soils while restoring forest cover in Ivory Coast.

There has been a substantial amount of research on carbon storage in soils, notably centring on the 4 per 1000 initiative (cf. interview with Rémi Cardinael). It is also one of the key issues for the DSCATT project, involving the social sciences, among other disciplines (cf. Abigaïl Fallot's work on soil metaphors, presented at the Paris International Agricultural Show). The overall objective of the CaSSECS project being rolled out in the Sahel countries by a consortium of 18 partners is to improve assessments of the carbon balance of (agro) pastoral livestock systems by quantifying their impacts sur on climate change more effectively, with a view to building suitable livestock policies. The International Research Consortium (IRC) on soil carbon, launched in November 2023, is an initiative supported by the EU that is aiming to bring together international players working on carbon capture and storage in soils. In particular, it is behind the Impact4Soil platform to foster knowledge exchanges and provide decision makers and farmers with science-based knowledge.

CIRAD's researchers conduct soil analyses both in the laboratory and in the field. Identifying their characteristics allows farmers to adapt their practices to manage fertility better. The Fertidom project in several French overseas departments is developing tropical crop fertilization support tools to foster the use of organic waste and legume crop residues, with a view to agroecological transition and territorial autonomy in Réunion and the French West Indies.

Agroforestry has also been identified as one of the most effective options, since it boosts in situ organic matter levels: on average, trees boost soil organic carbon levels on arable land by 20 to 25%, compared to systems without trees. CIRAD is implementing a number of agroforestry projects, including Cocoa4Future, Sustain Sahel and Breedcafs.



Coffee being grown under timber trees in Nicaragua © B. Rapidel, CIRAD

As regards land tenure issues, CIRAD analyses the reasons for and consequences of unequal access to land: Who is growing richer? Who is growing poorer? What type of crop or livestock farming is making progress or dying out? The role of CIRAD's scientists is to open a debate on the results, to allow crop and livestock farmers, policymakers and more broadly citizens in territories to decide what type of crop or livestock activities they want to promote and support, which will in turn determine their access to land. ■

julien.demenois@cirad.fr • **christophe.jourdan@cirad.fr**

Impact4Soil platform

Fertidom project website

TERRI4SOL
Restoring soils and the multifunctionality of degraded forest landscapes in Ivory Coast

Ivory Coast, whose economy is essentially founded on the primary sector, developed thanks to farming during the 20th century, but at the expense of its forest cover and the health of its soils. The country now faces three major agricultural and forestry challenges: (i) Moving from agriculture based on the fertility of newly cleared forest soils to sustainable, zero-deforestation agriculture adapted to current climate issues; (ii) Switching from "gathering"-type use of forests to sustainable production from trees grown in dedicated plantations, such as agroforestry systems; (iii) Overcoming the split between agriculture and forests to build multifunctional, resilient territories. This is what prompted the Terri4Sol project, which aims to help preserve and restore organic carbon stocks by exploiting the multifunctionality of the territories concerned, to foster local, economic and social development in the country. The project, which is due to run from 2021 to 2025, has funding from the Fonds français pour l'environnement mondial and is coordinated by CIRAD in partnership with the Ministry of Agriculture and Rural Development in Ivory Coast (Minader) and Nitidae. It has three components: helping the authorities in Ivory Coast and the stakeholders concerned to build and roll out a "4 per 1000"/Triple A strategy; building regional multifunctional territorial development scenarios; working with local people to construct and implement local land use scenarios in the Mé pilot region.

https://www.terri4sol.org/

https://www.youtube.com/watch?v=RDilUGT6JQ8&t=5s

4 pour 1000

Soils for food security and climate


CIRAD

Rémi Cardinael is a CIRAD researcher specializing in soil science and agronomy. Since late June 2024, he has been one of the 14 elected members of the Scientific and Technical Committee of the 4 per 1000: soils for food security and climate initiative. He is also co-author of the final report on a study of carbon storage in French soils, its cost, and its potential with regard to the 4 per 1000 objective.

What is the 4 per 1000 initiative?

4 per 1000 is an international initiative launched by France at COP21 in Paris in late 2015, with the aim of federating public- and private-sector players keen to build concrete actions to foster carbon storage in soils, for its beneficial effect on both food security and climate change. The initiative had been announced a few months previously by the French Minister of Agriculture, Stéphane Le Foll, at the Climate-Smart Agriculture Conference in Montpellier co-organized by CIRAD.

What is your role as a member of the initiative's Scientific and Technical Committee?

The STC is one of the 4 per 1000 initiative's four governance bodies. It has a range of remits, notably to set priorities for support in terms of international scientific research and cooperation programmes relating to soil carbon, to draft statements and guidance on projects submitted for formative evaluation and on the initiative's strategic plan, and to participate in disseminating knowledge on soil health by publishing scientific articles and policy briefs or organizing webinars and conferences.

What are the main scientific issues for CIRAD in relation to the initiative?

CIRAD has supported the initiative from the outset, and regularly co-organizes events, the latest of which was the Mediterranean Regional Conference on Soil Health in Rabat in October 2024. It is also involved in organizing the upcoming Latin America regional meeting in Rio in June 2025. For the first time since its launch in 2015, there is a CIRAD researcher on the STC, whose French members were previously from INRAE and CNRS. This is an opportunity for us to promote our knowledge of the soil-climate and socioeconomic contexts and the specific issues surrounding soil carbon in the global South, and to shine the spotlight on our local partners working on the topic. ■

remi.cardinael@cirad.fr

Knowing soils better

A researcher's point of view


CIRAD

Emma Belaud is a PhD student with the Eco&Sols joint research unit, helping to develop a new in situ soil imaging method to monitor root and soil invertebrate activity in a dynamic, integrative and non-invasive way.

What made you choose to work on soils?

I became aware of the many issues surrounding soils during my studies. Although they play a crucial role, little is known about them, and they offer huge prospects for research. This made me want to understand them better and to help add to the knowledge available in this field.

What are you working on at CIRAD?

I am currently writing my thesis. My research relates to how soil invertebrate communities are organized and the networks of interactions between soil invertebrates and roots in agroforestry systems in Mediterranean and semi-arid tropical climates. We are developing a novel soil imaging method to study these cryptic organisms, based on using buried scanners (cf. Scanorhize box below).

How are soil observations important for agricultural research?

Soils play a fundamental role as a support for food production, notably thanks to the activity of the many organisms living in them. It is estimated that a quarter of terrestrial biodiversity lives beneath our feet, yet little is currently known about it. Soils are therefore known as the "third biotic frontier". It is vital that we observe and understand that biodiversity to know how this complex ecosystem functions and make use of the many services it has to offer, particularly for farming systems. ■

emma.belaud@cirad.fr

Scanorhize, a "window on the soil"

Underground biological activity involves a number of phenomena that are essential for plant growth. CIRAD has developed watertight, energy self-sufficient scanners operating within the visible range, to produce time-phased soil images. Those images are then analysed by deep learning using a specific image recognition module. This provides appropriate indicators of biological activity: growth rate, lifespan and mortality rate, branching rate, rate of attacks, and mycorrhization rate. Scanorhize is currently hosted by the technology transfer acceleration firm SaTT AXLR's incubator, and is being transferred to a start-up in Montpellier. It is a great example of innovation transfer in the field of digital farming, with major potential for tackling climate change challenges in particular.

Partnerships

Sol AfricaO: A new platform for exchanges on soils in West Africa

Soil research in West Africa looks at a wide range of issues and calls upon a number of disciplines. By pooling their work, methods, tools, etc, scientists from France and West Africa are maximizing their chances of optimizing their results.

CIRAD

Interview with Hervé Aholoukpè, PhD in agronomy, agricultural soil scientist, Director of the Centre de recherches agricoles plantes pérennes (CRA-PP) at the Institut national des recherches agricoles du Bénin (INRAB).

What is Sol AfricaO?

Sol AfricaO is an adventure that began with African and French researchers working on different topics relating to soils in a number of networks in Ivory Coast, France, Senegal, Benin, etc, who decided to see how they could centralize work on soil functioning and health in West Africa. Researchers from various African institutions plus CIRAD, INRAE and IRD met up at a workshop Abidjan (Ivory Coast) in 2022, and decided to join forces. The aim of the initiative is to pool our expertise in order to build soil research projects in West Africa and attract ringfenced funding for the region. The network covers West African countries with very contrasting situations, from the southern Sahara to the Sahel, which guarantees fertile exchanges. In Benin, Ivory Coast, Burkina Faso and Senegal, we choose target crops and study soil functioning and other topics relating to soil fertility in dry or humid zones, involving researchers from INRAE, CIRAD, IRD and African organizations in Benin, Senegal and elsewhere. Sol AfricaO is an initiative that encompasses several aspects of soil research, from soil carbon to plant health and food nutritional quality in relation to soil health. In Benin, for example, where I work, we have worked on the beneficial effects of spreading pineapple harvest residues on the soil on future fruit and juice quality. Pooling our expertise has proved very fruitful, and allows us to respond to sub-regional calls for projects on a wide range of topics and contexts. There are plans for numerous activities, and to share, exchange or pool methodologies, tools and approaches between institutions. We also intend to co-author articles. The initiative is due to become a "platform in partnership for research and training" (dP) in 2025, alongside those that already exist.

Why are you involved in Sol AfricaO?

I am a founding member of the CASA network on soil carbon for sustainable agriculture in Africa, so my interest in this new initiative fits well with my previous commitments. In addition to soil carbon, I also work on anything to do with plant nutrition and product quality, which the initiative will also be studying, along with organic resource recycling, so I am familiar with the fields in which it will be working. And I am also a partner on an institutional level, as Director of a research centre working with CIRAD on oil palm. At INRAB, we also work on coconut-based cropping systems and market gardening, so I'm happy the platform is working on these topics. Water will also be a core subject in our studies of soils, and it is a crucial issue for oil palm growing in Benin, a relatively dry country, where we need to take a fresh look at how we manage it. The initiative will be looking into this.

I would point out, however, that the initiative's focal point for Benin is a teacher-researcher colleague based at Abomey-Calavi University, since I am focusing on the CASA network.

What are the specificities of this partnership with CIRAD?

In addition to CIRAD, the French partner organizations are INRAE and IRD, via the Eco&Sols joint research unit. CIRAD has expertise in terms of networks and particularly the dP system, which will allow the initiative to be launched and be operational rapidly. In terms of the topics covered, CIRAD also has substantial expertise in oil palm-based agroforestry systems, which will enable us to study the crop from several angles, notably in terms of agronomy. However, it also has specific physiology expertise, with a researcher who has worked extensively on root systems, and this is a major asset for Sol AfricaO. ■

Crop diversity in the Niayes zone, Senegal J. Bouyer © CIRAD

Publications and resources

Soil metaphors

Antonia Taddei and Abigail Fallot have listed more than 120 metaphors relating to the soil, collected during workshops and interviews in Senegal, Zimbabwe and France. Their book, published in 2024 with the title "Collection de métaphores du sol" (Compilation of Soil Metaphors) was to highlight the wealth of perceptions among farmers, scientists and the general public and encourage discussions of the topic of soils, in the hope of understanding, managing and preserving them in a sustainable way. Metaphors and the images they convey facilitate communication between individuals from different backgrounds and prompts them to question their perceptions. Abigail Fallot and Antonia Taddei are convinced that questioning standpoints in various places and viewing the vast amount of available information with a critical eye can foster more coherent, harmonious dialogue about soils. In the runup to the 2024 Paris International Agricultural Show, a web platform specially set up to collect soil metaphors allowed anyone and everyone to contribute to supplementing the compilation.

The book is available on line, free of charge.

Taddei Antonia, Fallot Abigail. 2023.
Collection de métaphores du sol
Dormelles: Cabanera, 197 p. ISBN 978-2-9588210-0-5

Abigail Fallot trained as an economist and now works for CIRAD, focusing on responses to climate change and working using deliberative methods. Antonia Taddei is a playwright and co-director of the Xtnt company, which specializes in multidisciplinary, participatory activities and works to give art a central place in society by generating strong synergies between artistic creation and public issues.

The two authors took part in an RFI radio programme, "Autour de la question". Podcast available on:

In addition to this book, CIRAD produced numerous articles, studies and publications in 2024. Here is a selection.

Osez ! S'approprier le droit pour protéger les sols.
Aubert Sigrid, Drygas Lukasz, Fallot Abigail, Taddei Antonia, Billet Philippe (collab.), Chevallier Tiphaine (collab.), David Victor (collab.), Goedert Nathalie (collab.), Karpe Philippe (collab.), Mariel Juliette (collab.), Serpantié Georges (collab.). 2024. s.l.: s.n., 6 p.

Tour d'horizon des contaminants présents dans les sols agricoles
Benoit Pierre, Doelsch Emmanuel, Bravin Matthieu. 2024. AFIS Science et Pseudo-Sciences (347): 49-55.
https://www.afis.org/347-Janvier-2024

Pour une gestion durable des sols en Afrique subsaharienne
Dugué Patrick, Andrieu Nadine, Bakker Teatske. 2024.
Cahiers Agricultures, 33:6, 12 p.
https://doi.org/10.1051/cagri/2024003

L'usage et les changements d'usage des terres en Afrique de l'Ouest et son influence sur le carbone du sol
Dugue Patrick, Andrieu Nadine, Bakker Teatske. 2024.
Cahiers Agricultures, 33:6, 12 p.
https://doi.org/10.18167/agritrop/20333

To find out more, see Agritrop, the CIRAD open archive:
agritrop.cirad.fr

Scientific research

In the light of the challenges posed by sustainable development in the global South in the current demographic, climate, environmental and social context, CIRAD and its partners are convinced that there is a growing need for knowledge and innovations.
To tackle those challenges and ensure that it is capable, through science, of helping societies in the global South to make a range of unprecedented transitions, CIRAD has identified six priority research topics.

Each of those topics relates to a major research issue shared with our partners in the global South, on which CIRAD has chosen to work collectively, in an integrated, multidisciplinary way, so as to reinvent, diversify and broaden its scientific and partnership-based output.

Atlas of the Senegal River delta

Shedding a critical light on development

An atlas published by CIRAD and the Institut sénégalais de recherches agricoles (ISRA) looks at development dynamics in the Senegal River delta, highlighting the tensions surrounding land use and resource management.

The Atlas of the Senegal River delta, drawn from several years of joint work by ISRA and CIRAD, sheds a critical light on the changes in the territory. The development model for the zone, which is crucial for the country's food security and economy, centres on irrigated agriculture, prioritizing hydro-agricultural installations over other activities such as pastoral livestock farming. Since the 1960s, that specialization has led to inequality in terms of access to land, exacerbated by competition for water and agricultural land.

The atlas stresses the merits of shared resource management and highlights the complementarity of crop and livestock farming. For instance, sugarcane waste is fed to animals while cow manure is used as an alternative to chemical fertilizers. These synergies are a way of resolving tensions between different users within the territory. The atlas also stresses the importance of pastoralism, which is often ignored by public policy despite being vital for the region's food security. Mobile cattle farms supply meat and dairy markets, but their lack of visibility means that they are neither recognized nor included in governance processes.

To overcome these challenges, the authors recommend strengthening existing planning tools, such as land use plans, and adapting public policy to current issues, notably those surrounding climate change and land management. The atlas aims to trigger a debate on territory management methods, highlighting the need for an inclusive approach capable of reconciling the various economic and social needs of the delta's inhabitants. ■

jeremy.bourgoin@cirad.fr

The Senegal River valley, in the Northwest of the country, is home to a large number of agricultural activities © J. Bourgoin, CIRAD

Simple indicators to measure wildlife degradation

A study in Gabon has revealed indicators for assessing the impact of hunting on wildlife in African tropical forests. The scientists involved identified two main indicators: the rodents:ungulates ratio and the mean body mass of offtake (captured animals). Their measurements showed that hunting has an adverse impact on large-bodied mammals, while benefiting smaller, more resilient species. The results also highlighted the need for sustainable hunting strategies to maintain an ecological balance, along with the importance of involving local communities in data recording. These simple approaches can be adapted to different contexts. Their speed with which field players can adopt them makes them vital for achieving global ecosystem preservation targets, while addressing food security challenges in zones where wild meat is an integral part of local people's diets.

daniel.cornelis@cirad.fr

A hunter in a Gabonese rainforest - SWM Project © D. Cornélis, CIRAD

Mining and forestry concessions

Deforestation and Saamaka rights in Suriname

In Suriname, mining and forestry concessions granted on the territory of the Saamakas, one of the country's tribal peoples, are causing shocking forest degradation and highlighting abuse of the rights of local communities.

Access road to land or mining concessions in Suriname, opened through the forest © Bram Ebus, ILC

Suriname, which is recognized as a global leader in forest preservation, nevertheless has a number of major domestic contradictions. Despite its professed commitment to combating deforestation, the government of Suriname continues to grant forest and mining concessions on land traditionally occupied by Saamaka communities. Those communities saw their territory recognized by the Inter-American Court of Human Rights in 2007, but since then, more than 40 000 hectares of forest concessions have been awarded to private firms, despite the Saamakas' repeated demands for their land rights to be respected and for prior consultations.

The concessions, which represent some 32% of Saamaka territory, are having devastating consequences for the environment and biodiversity. Local communities have received no information on the impact of these activities or the profits made from the land granted to private firms. The International Land Coalition (ILC), of which CIRAD is a member, has used satellite data and observatories to map the impact of these concessions and document violations. A report has been presented to the President of Suriname, the Vice-President, the President of the National Assembly and Members of Parliament.

The Saamakas' protests have succeeded in raising awareness among the national authorities, but ensuring that international decisions are respected remains a challenge. The situation highlights the importance of boosting transparency and guaranteeing the true consent of indigenous communities to land use projects on their territory. ■

jeremy.bourgoin@cirad.fr

Climate data in West Africa: growing urgency coupled with diminishing accessibility

West Africa is highly dependent on rainfed agriculture, which makes it particularly vulnerable to climate change. Climate data, such as rainfall, temperatures and humidity, are therefore essential for planning harvesting, forecasting yields and managing climate risks. Since the 1970s, CIRAD has been developing tools to gather and analyse those data, in collaboration with organizations such as the AGRHYMET centre. However, the situation is becoming increasingly complicated as a result of the growing need for and diminishing accessibility of reliable data. Remote sensing has enabled a degree of progress, but Africa remains insufficiently equipped with weather stations, the number of which remains well below international recommendations. Moreover, underfunded national meteorological services are selling their data in order to survive, making them increasingly difficult to access. This has created a paradox of growing urgency coupled with diminishing accessibility, which is a major issue for agricultural risk management in a region increasingly facing climate hazards.

jeremy.lavarenne@cirad.fr

Climate data are vital for planning harvesting, forecasting yields and managing climate risks © R. Belmin, CIRAD

Invasive exotic plant viromes

An underestimated health impact

A recent study revealed that invasive exotic plants often escape from the viruses of their original habitat, but end up interacting with local viruses, which increases the health risks for ecosystems.

A field invaded by *Bothriochloa barbinodis* at Octon, near Lake Salagou in the Hérault department, in 2015
© G. Fried

On arrival in a new environment, invasive exotic plants free themselves from the pathogens they faced in their original habitat, and are not initially attacked by local viruses. A team from CIRAD recently confirmed this hypothesis by means of the grass *Bothriochloa barbinodis*, a plant originating from the Americas that was introduced into France in the 1960s. The scientists compared the virus communities of *Bothriochloa barbinodis* populations in France and the US, and observed that the plant was initially virus-free but went on to interact with local pathogens after several decades.

The study focused on the environmental and health impact of such introductions. The initial absence of viruses fosters the spread of the species, which poses a risk for local ecosystems. Moreover, exotic plants are also likely to bring new viruses that may be transmitted to local plant species.

In view of these issues, the authors stress the importance of viral ecology, an as yet little-known discipline. A better understanding of how pathogens circulate within ecosystems could help prevent disease emergence and minimize the health risks associated with the introduction of new plants. To this end, initiatives such as plant quarantine services, which are already used for crops such as sugarcane, are vitally important for preventing viruses from spreading from one territory to another.

This research demonstrates the need for closer surveillance of introduced plants and of the sanitary quality of all plant material exchanged internationally. ■

philippe.roumagnac@cirad.fr

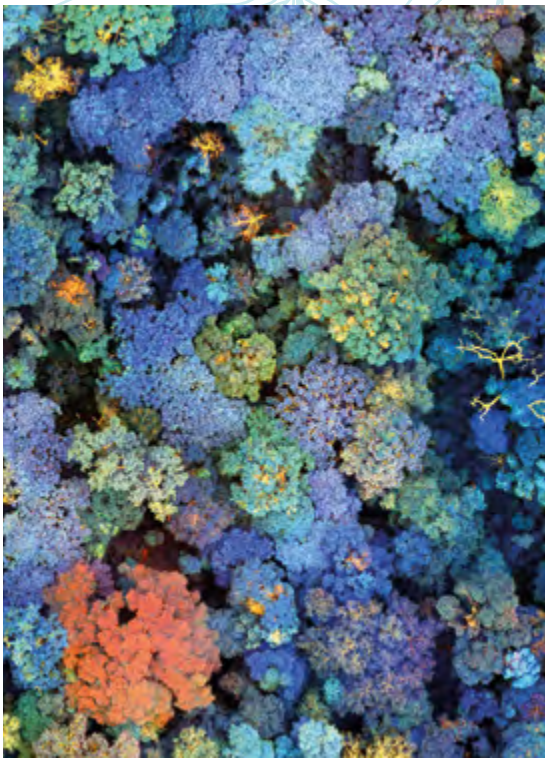
A map of the world's forests, to combat deforestation

CIRAD has contributed to a map of forest cover, produced by the EU Joint Research Centre. The map will be used as the basis for the EU Regulation on Deforestation-free Supply Chains (EUDR). CIRAD provided its expertise in satellite data interpretation and forest geography.

The document is a representation of where forests existed in 2020, with a spatial resolution of 10 m. The aim is to prevent imported deforestation, by banning imports into the EU of products associated with deforestation since 31 December 2020. The regulation will apply to all EU member States as of 30 December 2024, and notably applies to soybean, cocoa, palm oil, wood and beef.

While the aim is to reduce the EU's impact on ecosystems, a number of challenges remain, including collaboration with producing countries and the integration of shared definitions of deforestation. Increased pressures on producers, particularly in central Africa, are also giving cause for concern about the balance between conservation and development.

valery.gond@cirad.fr



The new EU regulation will mean an EU-wide ban on products associated with deforestation or forest degradation since 31 December 2020
© V. Gond, CIRAD

COP16

An integrated biodiversity-agriculture-health approach

Biodiversity COP16 highlighted the importance of considering intrinsically linked sectors simultaneously.

The commitment on the part of IPLCs (Indigenous People and Local Communities) to preserving biodiversity is a fundamental principle of the CBD © V. Gond, CIRAD

Discussions at the 16th meeting of the Conference of the Parties to the Convention on Biological Diversity in Colombia in Autumn 2024 underlined the importance of considering the links between different sectors in order to address global environmental and health crises. To give just one example, agriculture, which often comes under attack for its impact on biodiversity, needs to move towards sustainable practices that respect ecosystems while satisfying growing demand for food. Soil degradation, excessive chemical input use and biodiversity loss all exacerbate public health issues, notably infectious diseases and risks relating to climate change.

The solutions proposed include promoting agroecological practices, which conserve natural resources and make agricultural communities more resilient. The experts also stressed the need to strengthen transdisciplinary research in order to build a better understanding of these complex interactions and include them in public policy. Increased collaboration between scientists, policymakers and civil society players should promote nature-based solutions, to alleviate the adverse impacts on biodiversity while fostering human health.

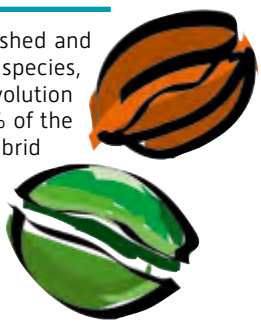
The conference was also marked by the establishment of international partnerships to share knowledge and coordinate operations to tackle global challenges. ■

servane.beaufume@cirad.fr

© A. Rival, CIRAD

The genetic secrets of Arabica coffee are no longer so secret

An international collaboration, in which CIRAD took part, has established and studied the genome of Arabica coffee (*Coffea arabica*) and its parent species, *C. canephora* and *C. eugenioides*. The research has shed light on the evolution and limited genetic diversity of Arabica, which represents about 60% of the world's coffee production. Arabica is a 500 000-year-old natural hybrid resulting from the balanced interaction between its parental genomes. The study identified key genes that influence bean quality and plant resistance in particular, as regards both health and climate aspects.



pierre.marraccini@cirad.fr

Carbon

Biochar, a lever for climate and agriculture

There is currently renewed interest in biochar, an ancient type of charcoal used in the Amazon more than 2000 years ago. It has many potential applications, such as carbon capture, energy, soil restoration and water purification.

Biochar was rediscovered recently, and is the object of considerable interest for its many environmental benefits. It was historically used by people in the Amazon to improve soil fertility, and is now recognized for its ability to capture carbon, making it a valuable climate mitigation tool. In addition to those carbon capture properties, biochar improves soil structure and water retention, making it particularly beneficial for agriculture. It also helps to reduce the need for fertilizers and to control parasites.

This charcoal, produced by heating plant matter (pyrolysis), can also be used as a filter to purify water, thanks to its ability to retain pollutants. However, despite its many potential advantages, developing viable economic value chains for biochar is still a challenge. Additional research is needed to optimize production methods and assess the long-term impact on ecosystems. Scientists at CIRAD are working to determine how to maximize its benefits while keeping costs and adverse environmental impacts to a minimum.

Biochar has good prospects for sustainable natural resource management and climate change mitigation. However, further research is essential to guarantee its efficacy and its widespread adoption. ■

alfredo.napoli@cirad.fr

Biochar was already used in the Amazon more than 2000 years ago. It is now being rediscovered as a lever for mitigating climate change © L.J. Parra Serrano, UFMAB

The sugarcane genetic code has been cracked, a major step forward for varietal breeding

The full genome of sugarcane, one of the most widely grown crops worldwide, has been sequenced after five years of research. The project, a collaboration between CIRAD and several international institutions, revealed a unique genome, with 114 chromosomes and 8.7 billion base pairs, three times more than for humans. Cultivar R570, which was obtained and developed in Réunion in the 1980s, was used to obtain the reference sequence.

This work will make it easier to identify genes of use for breeding varieties better suited to future climate conditions.

angelique.dhont@cirad.fr

© R. Caraygol

Launch of FORESTT: forest resilience to global challenges

The FORESTT research programme, which has 40 million euros of funding from France 2030, set out to make forest ecosystems more resilient to pressure from climate change, natural disasters and new land use patterns. The programme is led by INRAE, CNRS and CIRAD, and is looking at four aspects: governance, the bioeconomy, ecosystem adaptation and ecological monitoring. FORESTT suggests adopting interdisciplinary, collaborative approaches combining innovation, training and sustainable management, to anticipate and mitigate environmental challenges while supporting the forest-timber sector.

Mountain forest, Chirripo, Costa Rica
© B. Locatelli, CIRAD

Further information on the programme's website:
https://www.pepr-forestt.org/

Resilience

Diversifying forests to make them more drought-resistant

Diversifying the range of species within forests could boost their resilience to extreme drought. An international scientific study has demonstrated the importance of such a strategy.

Climate disruption is exacerbating droughts and heatwaves, threatening the health of the world's forests. An international consortium including CIRAD and INRAE has been looking at how diversifying the species in forests could make them more resistant to these types of extreme weather. The scientists involved conducted experiments on forests in France, Germany, Austria, Belgium and Italy, observing more than 20 tree species including oak, birch and pine.

The study, conducted during the 2022 drought, showed that the species of a tree influences its capacity to survive extreme droughts. For instance, holm oaks are more resistant than birch or pine trees, regardless of environmental conditions. The research also demonstrated that each species has different water use strategies, some of which are more effective than others in the event of drought.

At the same time, the range of species within a given forest has a positive overall impact on tree survival. Some combinations, such as holm oak plus pine or birch, are more drought-resistant, particularly since they improve water management and the amount of shade. The study suggests that forestry managers opt for mixtures of species, to reduce the risks of tree mortality.

These results are crucial for adapting forest management to climate change, and for developing forecasting tools to better anticipate and combat the effects of drought on forest ecosystems. ■

joannes.guillemot@cirad.fr

Young plants in a forest tree nursery set up under the "Ai ba Futuru - Trees for the Future" agroforestry project in Timor-Leste A. Rival © CIRAD

Family farming

A crucial lever for sustainability

Family farms play a vital role in feeding the planet and fostering sustainability. This was reaffirmed at the VIII Global Conference on Family Farming.

Family farming produces 80% of the world's food and employs around 30% of people. It is therefore central to the sustainability of global food systems, natural resource management and the preservation of local knowledge. At the VIII Global Conference on Family Farming, the World Rural Forum highlighted the importance of supporting this type of farming in the light of global food, economic and environmental crises.

Family farms vary considerably, but suffer from a lack of recognition in public agricultural policy. The experts at the conference called for support for national committees on this type of farming, which need to play a more active part in policy dialogue and in developing sustainable farming practices. Such committees act as platforms for exchanges aimed at adapting policy to the realities of family farms, particularly in the world's most vulnerable regions.

Through its participatory research and public policy support operations, CIRAD is contributing to building concrete solutions to support these types of farms. In opting for collaborative scientific approaches, it is helping to construct more inclusive management strategies that allow for local specificities, while strengthening the role of family farmers in the global ecological transition.

Family farming lies at the heart of planetary challenges, and is an essential pillar in boosting global food security and ensuring that international climate and environmental commitments are respected. ■

sara.mercandalli@cirad.fr

Family farms produce 80% of the world's food P. Dugué © CIRAD

Glyphosate: a threat to soil biodiversity

A study in Martinique has shown that intensive glyphosate use reduces soil invertebrate biodiversity by 21%. The herbicide fosters often invasive exotic species at the expense of native species. The effects are proportional to application frequency, and particularly concern predators and decomposers, an essential part of agricultural ecosystems. The mechanisms involved include the destruction of vegetation, which is vital for the soil fauna. Reducing glyphosate use or adopting alternatives such as grazing by sheep is therefore crucial to safeguard field biodiversity and agricultural product sanitary quality.

mathieu.coulis@cirad.fr

Banana planting in Rivière Lézarde (Saint-Joseph, Martinique) © C. Chabrier

Roots, tubers and bananas

Choosing the right varieties for Africa

The success of new root and tuber varieties depends on African consumer preferences as well as on agronomic criteria. A research team led by CIRAD has looked into the qualities consumers and processors in sub-Saharan Africa look for. Details of new varietal breeding tools and methods were recently published in the Journal of the *Science of Food and Agriculture*.

Programmes to breed new root, tuber and banana varieties in sub-Saharan Africa often encounter a major challenge: ensuring that those varieties will be adopted by consumers. The RTBfoods project, coordinated by CIRAD, has analysed African consumer expectations, notably in terms of product texture, taste, aroma, colour and processability. The study showed that provided varieties satisfy end users' specific requirements, they will be adopted, even if their agronomic performance is judged "inferior" to other varieties.

In sub-Saharan Africa, these products are vital for food security and the rural economy. However, the crops suffer from a lack of genetic diversity, making them vulnerable to climate change and diseases. Varietal improvement must therefore reconcile both agronomy- and preference-related aspects.

Thanks to the study, the researchers involved have been able to develop practical ways of integrating the entire range of quality criteria into varietal breeding programmes, hence helping to improve crop diversity and improve living conditions for people in rural areas. ■

dominique.dufour@cirad.fr

Peeling cassava in Nigeria
© D. Dufour, CIRAD

Managing desert locusts to prevent food crises

Preventive desert locust management steps can help avoid humanitarian crises, despite the impact of climate change

Desert locusts, a migratory insect capable of causing devastating damage to crops, are a serious threat to food security, particularly in West and North Africa. Invasions are intensifying, as a result of climate factors, exacerbated by climate change.

Recent research by CIRAD and INRAE has shown that preventive management strategies can limit the effects of climate warming on locust outbreaks. The research project, supported by FAO and the Agence française de développement (AFD), has proved the importance of active preventive management for avoiding the food crises triggered by such invasions. It has also highlighted the importance of international collaboration and ongoing research on the topic.

For further information: Herbillon F., Piou C. and Meynard C.N. 2024. An increase in management actions has compensated for past climate change effects on desert locust gregarization in western Africa. https://doi.org/10.1016/j.heliyon.2024.e29231

fanny.herbillon@cirad.fr

Desert locust (*Schistocerca gregaria*)
© C. Piou, CIRAD

Biofunctool®

A practical tool for assessing soil health

Biofunctool® is a low-tech, accessible tool for measuring soil health. It is backed by a newly developed mobile app and will help to facilitate the agroecological transition.

Biofunctool®, developed by CIRAD and its partners, is an innovative tool that measures soil health based on three key functions: soil structure maintenance, carbon dynamics and nutrient cycles. Those indicators are assessed by means of nine simple tests, for instance soil porosity observations or microbial respiration analyses. These tests are easily done in the field, and serve to produce an overall soil health index.

The approach is participatory: in doing the tests directly in their fields, farmers are involved in diagnosis and understand the complex range of soil interactions better. This dialogue ensures greater awareness of the importance of soil biodiversity for crop productivity and sustainability.

There is now a more accessible digital, online version of Biofunctool®. A mobile app makes it easier to input results, while certain tests can be done automatically, reducing human bias. This digitization will support the tool's role in agroecological strategies by facilitating its large-scale adoption, notably in tropical and Mediterranean countries.

Biofunctool® is therefore a low-tech, economical and educational solution that supports the agroecological transition and encourages farming practices that respect soils. ■

alexis.thoumazeau@cirad.fr

Most Biofunctool® tests are done directly in the field © CIRAD

A pilot sustainable banana farm in Colombia

CIRAD has been working with Lidl and its supplier AZ France to launch a pilot sustainable banana farm in Colombia. The aim is to halve the amounts of pesticides used in banana plantings while preserving fruit quality. The 96-hectare project includes local producers, researchers and distributors.

Lidl's "sustainable banana" strategy, launched in 2021, intends to halve phytosanitary product use in the chain by 2030. This commitment fits in with EU demands for more eco-friendly agriculture. The pilot farm also comes under the umbrella of the French sustainable banana initiative (IFBD), which is geared towards environmental sustainability, social equity and respect for human rights.

luc.de_lapeyre_de_bellaire@cirad.fr

CIRAD is helping a pilot farm in Colombia to develop sustainable banana cropping practices, in partnership with Lidl © CIRAD

A database on plants with pesticide effects in Africa

CIRAD and IRD have launched Knomana (for "knowledge management"), an online platform that compiles knowledge of plants with pesticide, antibiotic, antimicrobial or anti-parasitic effects. The database was developed to build on ancestral and scientific knowledge in Africa, and includes data drawn from more than 700 documents, including scientific articles, reports and books. The aim is to foster supervised use of these alternative solutions, at a time when resistance to chemical pesticides is giving cause for concern.

The data reveal that uses vary depending on local needs: mosquito control, grain storage or biological insecticides. Some plants, such as Lantana camara, illustrate this versatility. It is a small shrub that is effective against ticks that carry cattle and sheep diseases, but is toxic to or animal species, hence the need to take care when using it. The Knomana project has support from regional networks such as PPAf (Pesticide Plants in Africa) and the Divecosys platform in partnership for research and training.

pierre.martin@cirad.fr

Flowers of *Lantana camara* L., a small shrub effective against *Amblyomma* ticks, which carry serious cattle and sheep diseases. However, it is toxic to dogs © Long Nguyen, Pixabay

Further information on website
https://www.knomana.org/

Cooperation

Twenty years of scientific partnership with Madagascar

CIRAD is celebrating 20 years of cooperation with Madagascar, aimed at building sustainable farming systems and preserving biodiversity. Leaders from CIRAD, FOFIFA, the University of Antananarivo, Fifamanor, Africa Rice, GSDM and IRD met on 25 April 2024 to reaffirm their commitment by extending the partnership agreements covering two platforms in partnership for research and training – "Forests and Biodiversity" and "SPAD" – for a further five years.

In 20 years, the partnership between CIRAD and Madagascar has enabled significant rural development progress. The research programme concerned centres on two topics: improving farming practices and conserving natural ecosystems.

The research done on biodiversity and forest management has resulted in agroforestry methods that foster reforestation and the sustainable cultivation of endemic plants such as baobabs. CIRAD has worked with the local authorities to introduce eco-friendly practices and promote appropriate local solutions such as community forest management, through the GELOSE programme.

The second line of research concerns sustainable upland farming systems. The scientists involved have developed production systems that improve yields while preserving the environment. This includes breeding rice varieties more resistant to local climate conditions and promoting crop techniques that respect both soils and water resources.

In addition to these field initiatives, the partnership has served to build local capacity, by means of training and exchanges of knowledge between researchers, farmers and the public authorities.

After two decades of successes, the collaboration has been extended for a further five years. The aim is to secure its achievements and improve the inclusion of research results in local public policy, thus contributing to the sustainable development of agricultural value chains in Madagascar. ■

L to R: FIFAMANOR Director Heritiana Raoeliarimanana; GSDM Executive Director Tahiana Raoeliarison; IRD Representative in Madagascar Thierry Portafaix; FOFIFA Director General Fanoina Ny Riana Razafindrakoto; CIRAD CEO Élisabeth Claverie de Saint Martin; University of Antananarivo Vice Chancellor Lala Harivelo Ravaomanarivo; with the Africa Rice representative © M. Rananja, CIRAD

AfriCam

A project on early detection of emerging diseases

The AfriCam project set out to prevent the emergence of zoonotic diseases in Africa and Cambodia by means of an integrated, sustainable surveillance system. In January 2024, CIRAD organized the project kick-off meeting, an opportunity to present its transverse activities and bring together its 34 partners from five countries.

Human, animal and environmental health is interlinked © R. Belmin, CIRAD

The AfriCam project, coordinated by CIRAD in collaboration with IRD and several local institutions, set out to step up early detection of zoonotic diseases in five countries: Cambodia, Cameroon, Guinea, Madagascar and Senegal. The project falls under the umbrella of the PREZODE initiative, which is working to prevent pandemics of animal origin by building sustainable surveillance systems. The approach centres on integrating human, animal and environmental health, paying particular attention to the way in which those fields interact, to anticipate risks more effectively. AfriCam is taking concrete action in each country, rolling out epidemiological surveys, training and surveillance schemes alongside local communities.

Its activities are tailored to local situations and include participatory methods. There are constant exchanges between scientists, local players and public decision-makers. In Guinea, for instance, studies are under way to assess how local people perceive the health risks linked to wildlife. The country has already set up community surveillance schemes involving several hunting communities, to improve early detection of disease emergence.

The AfriCam project is distinguished by its ability to involve the range of stakeholders in building local risk management capacity. In Madagascar, studies of both animals and people have pinpointed a number of disease transmission factors. In Senegal, local communities are involved in prevention operations from the planning stage onwards.

AfriCam intends to be a model for cooperation between the public, private and research sectors, to guarantee the efficacy of public policy as regards emerging diseases. The project, which is due to run for three years, is fostering surveillance strategies tailored to local sociocultural and economic realities, while involving local communities to ensure long-term operations. In building partnerships and transverse strategies, AfriCam is a concrete example of an effective response to global health challenges. ■

marie-marie.olive@cirad.fr

The AfriCam project has 10 million euros of funding from the Agence française de développement. It is coordinated by CIRAD and IRD and is targeting five PREZODE member countries (Cambodia, Cameroon, Guinea, Madagascar and Senegal), from 2023 to 2025.

Citrus fruits and yellow dragon disease

Huanglongbing (HLB), or citrus greening/yellow dragon disease, is a threat to citrus farms worldwide. It is caused by a bacterium transmitted by psyllids, a type of sucking insect. The disease results in deformed, bitter fruits and tree degradation and eventual death. Regions such as Florida and Brazil have suffered massive economic losses as a result, and no sustainable solution has yet been found, despite substantial investment. Control operations are focusing on reducing psyllid population levels using biological control methods and developing resistant varieties.

raphael.morillon@cirad.fr

Mandarins grown in the Kintamani region (Bali, Indonesia) A. Rival © CIRAD

A technique that could revolutionize the fight against mosquito-borne diseases

The fight against mosquito-borne diseases such as dengue, chikungunya and Zika may have reached a turning point, thanks to the sterile insect technique (SIT). The method consists in releasing sterile male insects in infested areas, thus reducing mosquito population levels by preventing their reproduction. Studies in China have shown impressive results, with an 80% reduction in bites and a 40% drop in the number of female mosquitoes. The approach has several advantages over conventional pesticides, which may have adverse environmental effects. In addition to its efficacy, the SIT is a sustainable solution capable of specifically targeting disease-bearing mosquitoes. It paves the way for more eco-friendly management of the risks posed by disease vector insects.

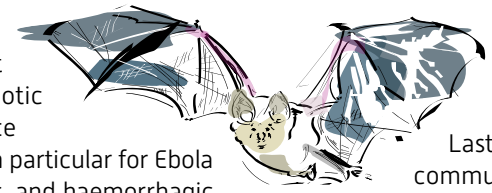
jeremy.bouyer@cirad.fr

© P. Landmann, IRD

EBO-SURSY

Key results for zoonosis control in Africa

The EBO-SURSY project has delivered its results, after seven years of work in Africa to strengthen zoonotic disease surveillance. Details of the progress made on training, awareness-raising and diagnosis…



The EBO-SURSY project set out to build zoonotic disease surveillance capacity in Africa, in particular for Ebola virus, Marburg virus, and haemorrhagic fever. The project, launched in 2017, was notably implemented in Republic of Congo. One of its first successes was training more than 700 local students and professionals. It also mobilized more than 200 technical agents and community representatives through awareness and public education campaigns on zoonosis risks.

Another important component of EBO-SURSY was improving surveillance protocols. Scientific field studies enabled a clearer understanding of virus circulation and the development of new diagnostic tests. The data gathered was centralized in an online database, to facilitate epidemic detection. The project also helped to draft an integrated surveillance strategy for Rift Valley fever, involving several ministries and international partners.

Lastly, involving local communities in disease surveillance was one of the project's priorities. Participatory approaches served to build local capacity for rapid detection of emerging epidemics. The project enabled 197 field surveys and collection of 43 000 animal and 6000 human samples, which will serve to prevent pandemics.

EBO-SURSY held its final feedback workshop in Republic of Congo in June 2024, organized by CIRAD and the World Organisation for Animal Health (WOAH). Participants bore witness to the key role played by the project in zoonosis control in Africa, notably by improving surveillance, training and preparation for epidemics, which will have long-term impacts in the region. ■

mathieu.bourgarel@cirad.fr

Taking non-invasive samples from a *Rhinolophus hipposideros* (lesser horseshoe) bat colony in the Magweto Cave, Zimbabwe © IRD-CIRAD - A. Jimu, CAZCOM project

CIRAD conducts research operations in partnership through its regional offices in the French overseas regions and other countries. Those offices report regularly on its research work via their own media, websites, social networks and newsletters to which anyone interested may subscribe. A small selection of their news items...

Southern Africa and Madagascar

BiodivClo project: Analysing the environmental and socioeconomic impacts of clove-based agro-ecosystems

Farming on the East coast of Madagascar is marked by cash crops, particularly cloves, vanilla and lychees, which account for a major share of local people's incomes. The BiodivClo project, initiated by CIRAD in 2023, is looking into the previously little-studied impacts of clove-based agro-ecosystems on biodiversity, the economy and the environment in Madagascar.

Clove-based agro-ecosystems, which provide both cloves and essential oil, are often highly diversified. However, while that diversification could be assumed to benefit farmers, there is a need for an analysis of the interactions between biodiversity and technical, economic and environmental performance, as well as the resilience of these systems. This is what the BiodivClo project being implemented by CIRAD since 2023 with funding from the French Agence nationale de la recherche (ANR), in partnership with Fofifa and AVSF, set out to do. By means of a multi-disciplinary, multi-scale approach, the project aims to (i) assess the impact of clove growing on plant biodiversity; (ii) examine the interactions between biodiversity and economic and environmental resilience, and (iii) identify opportunities for optimizing technical, economic and environmental performance. The village of Antsirakoraka, in the heart of the clove-growing zone, is the pilot for immersive ecological surveys, landscape analyses and mapping using drones. These observations, coupled with active farmer participation, will enable in-depth analyses of biodiversity and associated ecosystems. They should provide a better understanding of the factors that affect clove yields and serve to quantify carbon stocks in farming systems, explore the sustainability of essential oil production, boost food security and make households more resilient. The project, which is due to run until 2026, is intended to reconfigure agro-ecosystems, alongside farmers, to improve their sustainability and resilience. ■

Agroforest landscape on the east coast of Madagascar © J. Sarron, CIRAD

BiodivClo is funded by the Agence nationale de la recherche (ANR).

julien.sarron@cirad.fr

Central Africa

Understanding how cocoa agroforests respond to climate change

Plans are underway to install a flux tower in a 40-year-old mature cocoa plot in central Cameroon, to measure carbon, water and energy exchanges between an ecosystem and the atmosphere. The 55-metre-tall tower will provide information on the possible role of cocoa agroforests in mitigating climate change.

The entire mission team © I. Cornut, CIRAD

To put it more precisely, the "cacao-for-flux" flux tower is intended to answer several questions about carbon and water cycles and energy flows. Flow measurements across the plot will be used to study how transpiration responds to seasonal drought, along with inter- and intra-annual carbon flux variations. The facility is being set up under the FairCarboN programme, which is working to understand carbon dynamics within terrestrial ecosystems, quantify stocks and flows on different spatio-temporal scales, and pinpoint the relations between the carbon cycle and other biochemical cycles, including that of water, against a backdrop of global change.

This equipment will be funded via the Rift project, under the umbrella of the FairCarboN Priority Research Programme and Infrastructure (PEPR) co-coordinated by CNRS and INRAE in partnership with CIRAD. ■

ivan.cornut@cirad.fr

For further information:

News from our regional offices

West Africa – Forest and Humid Savannah

Reducing soil erosion while improving biodiversity, for agroecological rubber growing

A team of researchers in Ivory Coast recently demonstrated that combining returning crop residues to the soil with sowing a legume crop drastically reduces erosion while improving soil structure and biodiversity. As FAO sees soil erosion as one of the main ten challenges affecting soils, these results pave the way for innovative agroecological practices to make rubber plantings on slopes more sustainable.

Rubber is a major agricultural value chain in many countries in the global South, and is grown on a 25- to 40-year cycle before felling and replanting the same plot for another cycle. The usual practice between two cropping cycles is to burn or remove crop residues, even though they contain large amounts of nutrients and carbon, which are essential for soil biological and mineral functioning. On the SOGB plantation in southwestern Ivory Coast, four strategies have been tested in a young rubber planting, set up with or without crop residues and a legume cover crop. After three years, the scientists involved have demonstrated significant correlations between soil erosion, macrofauna biodiversity and soil structure indicators. Their results suggest that high soil biodiversity ensures reduced erosion, thanks to improved water infiltration and better aggregate stability in particular. Those results, obtained by means of a collaboration between scientists (CIRAD, IRD, Nangui Abrogoua University) and a plantation firm, along with the Société des caoutchoucs de Grand Béréby (SOGB, Socfin group), were published in February 2024 in the journal *Science of the Total Environment*. ■

This study was conducted as part of the Fertim project.

West Africa – Dry Zone

Thirty-eight pilot farmers have been trained in agroforestry

An "ideal farm" is one that combines multiple agronomic levers. In Mbane, northern Senegal, in July, some 40 producers were given training in agroforestry as part of the Santés & Territoires project.

In Senegal, a team from the Santés & Territoires project is working to co-design agroecological production systems capable of improving plant, environmental and human health around Lake Guiers. From 1 to 4 July, the team held a workshop to launch agroforestry activities in the Mbane living lab. In 2023, its members had worked with local players to design a model integrated agroecological farm for use as a prototype to set up pilot transitional farms in the Mbane rural community living lab. That ideal farm was designed to combine a multitude of agronomic levers, in order to optimize water use and boost natural regulation of organic matter flows between market gardens, integrated rice-fish farms and livestock farms. Thirty-eight producers from Mbane volunteered to test the model on their farms. On a subsequent trip to Mbane, the team organized a training course in the basic principles of agroforestry for those 38 producers-testers. Among other things, the participants worked on the co-design of the agroforestry aspects of the pilot farms, in the presence of the local authorities. They also fine-tuned the choice of tree species, planting methods and spacing. ■

The Santés & Territoires project is jointly funded by the Agence française de développement and the European Union

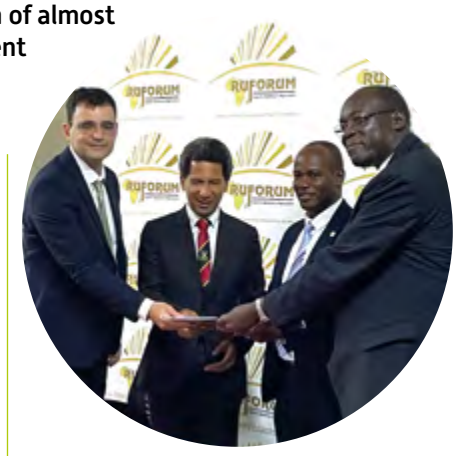
Symbolic planting of a tree in a farmer's plot, by Habib Mbaye, Deputy Sub-Prefect of Mbane
© R. Belmin, CIRAD

East Africa

CIRAD is partnering the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM)

CIRAD made an official commitment to RUFORUM with the signing of a Memorandum of Understanding on 25 April 2024 in Kampala (Uganda). This institutional link with the consortium of almost 180 African universities is a strong signal, reflecting CIRAD's growing commitment to research and higher agricultural education in East Africa.

RUFORUM, a consortium of African universities founded by ten university chancellors in 2004 with a secretariat at Makerere University in Kampala (Uganda), now includes almost 180 universities in 40 countries across the continent. In line with its belief that transforming agriculture and associated economic sectors in Africa calls for innovative approaches in terms of scientific research, education and extension, bolstered by unfailing support from the African Union and the African Development Bank, and working closely with FARA (Forum for Agricultural Research in Africa, one of CIRAD's contractual partners), RUFORUM has become an essential partner in agricultural research and development and higher education operations in Africa. This is what prompted CIRAD to make its official commitment, signing a Memorandum of Understanding on 25 April 2024 during a trip by its Deputy Director General in charge of Research and Strategy, at a ceremony presided by Xavier Sticker, French Ambassador to Uganda. The signing is the fruit of numerous talks with RUFORUM Executive Secretary Patrick Okori, notably during his participation in the Montpellier Global Days (France) and the DeSIRA CONNECT Days in Accra (Ghana). This collaboration has also seen an interest on the part of the latter in the CEA-FIRST project, part of the African Union-European Union partnership, and membership of the TSARA initiative's External Advisory Committee. In a move warranted by current events in the Sahel, CIRAD has a growing number of projects and staff members in the region, bolstering its position in East Africa. It is less well known in the region than in French-speaking Africa, and must confirm its position in an institutional environment marked by the presence of the HQs of many international organizations and a scientific research landscape dominated by One CGIAR centres and the increasing importance of universities. ■



Signatories of the MOU, L to R:
CIRAD Deputy Director General in charge of Research and Strategy Sélim Louafi;
French Ambassador Xavier Sticker;
Nkumba University (Uganda) Vice Chancellor and RUFORUM board member Jude Lubega;
RUFORUM Executive Secretary Patrick Okori

patrice.grimaud@cirad.fr

Mexico, central America and Andean countries

Innovative food technologies to benefit small-scale producers

In Colombia, CIRAD is working with the Agrosavia public scientific organization, to test innovative fruit processing technologies for use by small-scale producers' organizations. Those technologies will allow operators to process many fruits (Andean raspberry, physalis, plantain, coconut, açai and others) on a small scale, while respecting the highest quality standards. The technology centre set up by Agrosavia and CIRAD near Medellín has innovative facilities for small-scale fruit juice and puree pasteurization, drying and chip production. The equipment, built on site using plans supplied by CIRAD's QualiSud joint research unit, has been adapted to local products, keeping investment and small-scale processing costs to a minimum while taking care to adhere to the strictest possible market standards. Microfiltration, flash-release and vacuum fry-drying have been tested for numerous fruits on a semi-industrial pilot scale. Small-scale producers' organizations in several regions will now be testing entire production lines under actual operating conditions. Potential markets for all the products concerned have been identified and explored by means of market simulation tests at the technology centre. ■

fabrice.vaillant@cirad.fr

Demonstration of the bag-in-box Andean raspberry puree production process to the sons and daughters of smallholders from the ASOFRUTAS association (Colombia) © F. Vaillant, CIRAD

French West Indies, French Guiana and Caribbean

New high-tech equipment to analyse natural substances from the Amazon

Thanks to the purchase of new equipment by CIRAD's Ecology of the Forests of French Guiana (Ecofog) joint research unit, it is now possible in French Guiana to characterize rosewood perfume quality, study the relations between tree chemical composition and taxonomy, and understand the chemical diversity of ant or poison dart frog venom. The new equipment, a gas chromatograph coupled with a mass spectrometer, will serve to identify biomolecules, thanks to specific devices for biovolatile substances. It will boost the analytical chemistry capacity of the platform shared by ECOFOG and the LEEISA support and research unit in Cayenne and should produce new knowledge of the diversity of natural substances from the Amazon. The equipment will be of use both to fundamental research, notably on the chemical ecology and defence strategies of organisms, and development research in economically important sectors such as cosmetics, nutraceuticals or pharmaceuticals. It will make it possible to satisfy requests from academic and industrial project leaders and serve as a training facility in direct connection with the University of French Guiana. ■

daniela.florez@cirad.fr

The GC-MS Trace 1610-ISQ700 coupled with the riPlus RSH Smart autosampler © R. Lehnebach, CIRAD

Continental Southeast Asia

A One Health database to combat zoonoses

A regional workshop on the PREZODE initiative was organized by CIRAD and the GREASE platform in Bangkok (Thailand) on 26 March 2024. Among other things, it was an opportunity to unveil a new shared platform aimed at mapping One Health activities in the region.

Southeast Asia is an at-risk zone for many zoonoses, requiring the countries concerned to cooperate with each other. CIRAD, IRD and INRAE launched the PREZODE (PREventing ZOonotic Disease Emergence) initiative to prevent the emergence of infectious diseases with pandemic potential by strategically targeting at-risk zones to support and integrate their One Health networks. A workshop was organized under the umbrella of the initiative, in association with the GREASE platform in partnership for research and training, focusing on the interdisciplinary approach at the heart of One Health. The event reflected the extensive collaboration across the health, agriculture and environment sectors, and brought together experts from various fields, organizations and networks, such as the World Organisation for Animal Health (WOAH), the Center for Agriculture and Bioscience International (CABI), the Department of Disease Control at the Thai Ministry of Health (DDC, MoH), and national One Health university networks in Vietnam (VOHUN), Laos (LAOHUN) and the Philippines (PHLOHUN). The highlight of the workshop was the unveiling of an innovative database developed under PREZODE with the aim of mapping One Health activities in the region along with the institutions involved, to ensure effective knowledge-sharing and collaboration. Based on the database, at regional and national levels, the verious partners from different sectors engaged in One Health will be invited to co-design the next project, ensuring that any gaps are filled and taking care not to duplicate what already exists in the region. ■

flavie.goutard@cirad.fr

Participants in the PREZODE initiative regional workshop © L. Vo, CIRAD

Southeast Asian Islands

Conservation and sustainable management of spice trees

Cloves and nutmeg, two spice trees, are an inestimable heritage for the Sulawesi (Celebes) and Moluccan archipelagos in Indonesia. However, they are under threat, and conservation efforts are urgently required to safeguard them.

Drying cloves after harvesting, Likupang region, North Sulawesi, Indonesia © JM Roda, CIRAD

Cloves and nutmeg are native to Indonesia, and are of major socio-economic importance to millions of farmers in the tropics. However, these species are currently under-characterized scientifically, which represents an obstacle to the implementation of conservation and sustainable management strategies. In particular, this concerns the characterization of existing varieties, their use by local populations, the knowledge and skills associated with them, and their genetic diversity. CIRAD, along with IRD (HORTSYS and DIADE joint research units), is working to develop a methodology for characterizing the genetic and varietal diversity of agrobiodiversity, focusing initially on clove trees. The aim will be to characterize that diversity within the species' area of origin in Indonesia, around the so-called Wallacea region (Celebes, Moluccan Archipelago), but also within areas of introduction in Indonesia and other tropical regions (particularly Madagascar). Characterizing the spatial organization of the genetic diversity of these species will help guide strategies for conserving their genetic resources (in situ and ex situ conservation). Furthermore, characterizing the distribution of the species' genetic diversity in its area of introduction, to compare it with natural populations, will help guide the introduction of new diversity resources in the areas of introduction (in a South-South collaborative framework. ■

jean-marc.roda@cirad.fr

Cloves E. Penot © CIRAD

Brazil and Southern Cone

"Sowing Prosperity": a partnership to boost communities' incomes

After an initial memorandum of understanding on 29 April 2024, CIRAD and Suzano, a Brazilian paper pulp producer, signed their first cooperation agreement in August, covering implementation of the "Sowing Prosperity" project in the Brazilian Amazon municipality of Paragominas. The aim is to alleviate poverty by rolling out sustainable farming practices relating to the types of biodiversity seen as a priority. This cooperation between Suzano and CIRAD is intended to take 250 people out of poverty within a year, in the municipality of Paragominas, Pará state, Brazil. Paragominas is one of the territories covered by the TerrAmaz project in which CIRAD has had research and development operations for many years. By means of territory-based approaches and a broad partner network, the project is building solutions to restore efficient landscapes, create territorial certification schemes, support rural and indigenous communities, and improve farming practices, among others. To achieve its objectives, it is working with three local partners involved in Amazonian fruit and honey value chains. In addition to implementing innovative farming practices, the aim is to encourage entrepreneurship and build new knowledge within rural communities, centring on product quality and processing. Diversifying production, making women more financially independent, and supporting value chains built on sustainable, inclusive agriculture will boost incomes within the partner communities. ■

The project is due to run for a year, and has the equivalent of 64 000 euros of funding from Suzano.

rene.poccard-chapuis@cirad.fr

Intercropping sorghum and pigeon pea allows farmers to develop aviculture and abandon burning © R. Figueiredo

Mediterranean, Middle East and Balkan countries

Agroecology and water resilience for sustainable food systems

The MAHDIA project aims to help build sustainable food systems in three territories in Morocco, Tunisia and Senegal. It was presented during a roundtable at the Moroccan International Agricultural Show in Meknès in April.

The MAHDIA project, coordinated by CIRAD and INRAE, aims to address agricultural, food, environmental and health issues in the regions of Meknes in Morocco, Kairouan in Tunisia and Fatick in Senegal. Like the project, the roundtable brought together producers, teachers, scientists and professional and institutional representatives. MAHDIA is intended to design and implement a participatory approach to develop regional platforms that bring together all the players in food systems in the areas where the project is to be implemented: farmers, processors, distributors, restaurateurs, local authorities and consumers. To this end, the project will be based on the concept of a "product of regional interest", linking agricultural and food issues. Three joint research units involving CIRAD and INRAE in Montpellier are being mobilized on water management, innovation and food systems (G-EAU, Innovation and MoISA). The project, which also involves the Institut national agronomique de Tunisie (INAT), the École nationale d'agriculture de Meknès (ENAM), the Institut sénégalais de recherches agricoles (ISRA) and Institut Agro Montpellier, is scheduled to run for a year and a half and has one million euros of funding from the French Ministry for Europe and Foreign Affairs. ■

Agricultural landscape in Kairouan governorate, Tunisia © O. Lepiller, CIRAD

sandrine.dury@cirad.fr

For further information, see the interview with two of the project coordinators, Mostafa Errahj from ENA Meknès and Olivier Lepiller from CIRAD

Réunion, Mayotte and Indian Ocean

What does the future hold for vanilla in the light of climate change?

In June 2024, Réunion hosted the 5th International Vanilla Congress, marking the event's return to the heart of one of the main production basins of this orchid that flavours so many desserts.

The congress brought together no fewer than 85 experts from 20 countries, focusing on topics of vital importance for the future of vanilla: bioecology, the diversity of resources and uses, innovations and trends in terms of preparation and trading, and new approaches and practices aimed at ensuring sustainable vanilla production against a backdrop of climate disruption. Vanilla is an orchid that has suffered substantial genetic erosion, making it particularly vulnerable to the impacts of climate change. The very future of its production is under threat. Increases in the number of extreme climate events and in temperature variability are compromising crop productivity, changing their development phases and encouraging rodents to multiply. Moreover, the area suitable for growing vanilla could also be substantially reduced. Solutions based on genetic and agroecological approaches and on adapting crop management practices must therefore be devised, to make vanilla more resilient to these threats. The aim is to optimize production techniques, build plants' capacity to resist environmental pressures, and diversify cropping methods in line with local climate specificities. ■

85 experts from 20 countries met in Réunion in June 2024 for the 5th International Vanilla Congress © A. Tock, CIRAD

carine.charron@cirad.fr


RR

A roadmap setting ambitions for the coming five years

In publishing a participatory roadmap for the French overseas regions for the period 2024-2028, CIRAD has clearly stated its ambition to turn its research towards finding solutions that meet the needs of people in those regions.

Three questions for Jean-Marc Thévenin, Overseas Regions Officer at CIRAD

The CIRAD roadmap for the French overseas regions is the fruit of a co-construction process comprising a series of workshops and consultations, both in-house and elsewhere. The document was validated in October 2024, and sets out the main objectives the organization will be pursuing over the period 2024-2028 for the French overseas regions of French Guiana, Guadeloupe, Martinique, Mayotte and Réunion. The roadmap also lists, albeit in a non-exhaustive way, a series of activities in the Pacific territories, which will be covered by a subsequent specific in-depth reflection. It fits in with CIRAD's 2018-2028 Strategic Vision and tallies with the main outlines defined in the 2024-2026 Objectives, Means and Performance Contract (COMP) signed by CIRAD and its line ministries. Within the organization, it rests on the ambitions listed in the ten-year value chain roadmaps and reflects CIRAD's 2024-2026 scientific, strategy and partnership objectives (OSSP3) in the French overseas regions. The roadmap comprises five main ambitions: (i) To generate scientific knowledge (around three principal issues: food sovereignty; agroecology and One Health; and adapting to climate change and combating biodiversity erosion); (ii) To consolidate and mobilize partnerships; (iii) To build innovation systems that bring change and impacts; (iv) To develop public and business decision support tools; and (v) To promote structural instruments for scientific cooperation.

Why does CIRAD have an Overseas Regions Officer?

The post fits in with CIRAD's overall wish to promote the overseas regions within the organization, by boosting the visibility of its activities in those regions and working to make optimum use of its scientific forces to benefit them. The aim is also to build better dialogue with our technical, institutional and political partners about a clearly set-out strategy and about what we do in the overseas regions, for them and with them. This meant appointing a dedicated officer, to act as a point of entry.

How and when was the roadmap built?

The exercise began in early 2023 and ended with a presentation to CIRAD's Board of Trustees in October 2024. The process involved both in-house work at CIRAD, to bring all our teams on board, and workshops and consultations with our partners on the ground. It culminated in the organization of a seminar focusing on working together to build CIRAD's strategy, in late November 2023 in Montpellier. The idea was to identify the challenges facing the overseas regions, so as to adapt our research and development operations in those regions. A consultative committee was set up during the seminar, to support the drafting of the roadmap. It includes representatives from local authorities, the State and its decentralized services, and the body in charge of developing the agricultural economy in the overseas regions (ODEADOM).

How is the roadmap due to be rolled out?

There is a CIRAD team tasked with organizing the rollout, comprising the Regional Director for the French West Indies-French Guiana-Caribbean, the Regional Director for Réunion-Mayotte-Indian Ocean, and me, working both in-house and with our partners. The roadmap is very concrete, with a number of tangible indicators and deliverables that will guide its rollout. Lastly, the consultative committee is due to become a monitoring committee, to oversee implementation. Its effectiveness will obviously depend on the resources allocated to it, via projects, and, in-house, on mobilizing the necessary human resources and opening up our infrastructures to allow us to receive more partners and increase regional cooperation. A certain number of operations are already under way within CIRAD. ■

outremer@cirad.fr

For a shared impact culture within CIRAD and with its partners

The ImpresS (Impact of Research in the South) team works to boost the impact culture within CIRAD and among its research and development partners. In 2024, it mobilized its partners with a view to expanding its activities, through both support and training operations and exchanges.

In synergy with the other components of the new Finalité Impact (Impact Objective), the team is working to develop postures, frameworks and approaches to boost the transformative impact of research. It combines mutually beneficial support, research and methodological development activities.

Supporting multi-player groups

In the course of 2024, the team helped groups from CIRAD and its partners to: i) build theories of change relating to new projects and thematic initiatives centring on pastoralism, pulses, the One Health approach (PREZODE) and pesticide reduction (PRETAG); ii) design and roll out project monitoring and evaluation systems, particularly those funded by the European Union and the Agence française de développement; and iii) carry out an ImpresS ex post impact evaluation of the tsetse fly eradication strategy in the Niayes, Senegal, and an evaluation of the changes linked to the rollout of the project to improve livestock disease surveillance and control in Nigeria (LIDISKI).

Building appropriate methods and tools

From a methodological point of view, 2024 offered an opportunity to work on hybridizing the approaches the team uses. A combination of foresight tools and participatory impact pathway building was tested on various cases and documented in the quarterly New Directions for Evaluation, one of the two official journals of the American Evaluation Association[1]. The ImpresS ex post impact evaluation method was combined with a framework for analysing technology adoption processes, with a view to evaluating a research programme in Vietnam, following a request from the Australian Centre for International Agricultural Research (ACIAR).

Contributing to learning and sharing of the lessons learned

The first Evaluation Report 2020-2024, coordinated by the ImpresS team, was published this year. It details the results of and what has been learned from the evaluations of ten interventions that differ in terms of geography, type of research and development activities, and the diversity of stakeholders. The report illustrates the commitment of CIRAD's research teams working alongside local, national and international protagonists seeking to address the challenges posed by climate change, biodiversity preservation and use, health, and food security. It shows the paths taken, the progress made and the difficulties encountered, and is an invitation to improve R&D practices by building on the lessons learned in future operations.

Change evaluation of the GABiR project © T. Teixeira Da Silva Siqueira, CIRAD

Comparing notes

The introduction to participatory impact pathway building approaches organized for teams from the four projects chosen by the PREZODE Priority Research Programme and Infrastructure (PEPR) was a chance to work with INRAE's "Analysis of the societal impact of research" (ASIRPA) team and to present and compare the methodological proposals built together. A webinar organized jointly with F3E looked at the transverse analysis of monitoring and evaluation systems and practices at CIRAD and among cooperation and international aid players in France. Research and exchanges on the development of a culture of impact with EMBRAPA (Brazil) and AGROSAVIA (Colombia) resulted in the publication of a scientific article in the journal Research Policy: Culture of impact in agricultural research organisations: What for and how? (Ferré et al., 2024). It compares the organizational approaches deployed and the different types of change generated on an individual and organizational level at three research centres. These various events all provided a chance to progress hand-in-hand with key partners, towards a stronger culture of impact. ■

equipeimpress@cirad.fr

1. Adapting and combining foresight and *ex ante* impact pathway evaluation for place-based research planning with stakeholders. Genowefa Blundo-Canto, Marie Ferré, Leidy Tibaduiza-Castaneda, Nadine Andrieu, Sandrine Fréguin-Gresh, Gonzalo Rodriguez-Borray, Adriana Santacruz-Castro, Sara Mercandalli. July 2024.
https://doi.org/10.1002/ev.20608

Read the Evaluation Report:

Value chains

A resolutely international year

Our inter-unit research teams working on 13 major tropical value chains now have a roadmap for the coming decade. The year 2024 was devoted to its rollout, with a common thread – partnerships and transversality – and a framework – the international level.

The year 2024 was devoted to launching and supporting action plans to put the value chain roadmaps into practice. CIRAD's research teams worked with its partners to build often multidisciplinary, sometimes multi-value-chain projects, find new ways of sharing knowledge, write books, organize conferences and webinars, and launch and coordinate multi-stakeholder platforms. All those actions were intended to help tropical value chains achieve agroecological transition, to make farming and food systems more resilient and sustainable. The "Value Chains Day" organized on 18 April 2024 highlighted the links between value chains, training, the platforms in partnership for research and training, and transversality, while replacing value chains within CIRAD's new scientific and partnership strategy objectives (SPSOs) for 2023-2026. As further proof of the vitality of the value chain approach, 2024 also saw the emergence of two new "value chains": forest resources and pulses, which will be formalized shortly by two new roadmaps.

The WMA, an emblematic inter-stakeholder alliance for sustainable banana chains

CIRAD's inter-unit value chain research teams, coordinated by its value chain coordinators, are increasingly promoting, leading and supporting consortiums and multi-stakeholder platforms, which serve to build collective action for greater impact. For instance, the aim of the World Musa Alliance (WMA) launched by CIRAD is to join forces to address the sanitary threats facing banana chains (banana black Sigatoka, TR4 fusarium wilt, etc), using varietal diversity and breeding. The initiative is an alliance of research players and stakeholders in local market- and export-oriented dessert banana production and marketing chains. CIRAD and its Vitropic subsidiary, which head one of the world's first banana genetic improvement programmes, suggested to some of CIRAD's traditional partners and other more recent ones that they test varieties resistant to the main two banana diseases. The alliance is thus serving to test new varieties in various production and market contexts and maximize the likelihood of rapidly developing varieties suited to the sector's requirements. The WMA has two advantages: it allows academia and private operators to work together to build the systems of the future (new varieties x cropping systems), and it shortens the time required to build innovations. Developing varieties means involving pioneer producers. Facing the realities of different practices and soil and climate conditions during production and marketing is an important part of varietal development and their subsequent acceptance.

Cutting pesticide use by means of a multi-value-chain approach: the PRETAG initiative

Pesticide use on tropical and intertropical crops has risen significantly since the 2000s, exacerbating the adverse consequences for human health, biodiversity and ecosystem health in tropical countries. PRETAG, being implemented by CIRAD with the support of Agropolis Fondation-One Science and the FARM Foundation, has brought together a

North-South community of researchers and agents of change (producers, public and private decision-makers) to reduce pesticide use. Various systems are under study: periurban market gardening and cocoa growing in West Africa, rice growing in Southeast Asia, coffee growing in Latin America and Asia, and banana production in Africa and Latin America. In the space of two years, many objectives have already been achieved: a set of quantified data on pesticide use in the tropics (a database) has been compiled, the main obstacles to reduction and levers for action have been characterized, and global advocacy operations fuelled by the project's data have been launched to raise awareness among stakeholders and donors.

www.pretag.org

Helping value chains adapt to increasingly complex regulations

Supplying the world's people with healthy, sustainable food requires stricter food safety and environmental protection regulations. EU regulations are having a significant impact on tropical value chains such as cocoa, coffee, rubber products, wood and its derivatives. Among other things, the CIRAD teams working on those chains are working to help partners in Cameroon and Thailand with the rollout of the EU regulation on deforestation and forest degradation (EUDR). The multi-stakeholder partnership platforms CIRAD has built are set to play a central role in helping value chain stakeholders satisfy the increasingly strict requirements of public and private regulations and standards. ■

alexia.prades@cirad.fr
francois.cote@cirad.fr
denis.loeillet@cirad.fr

At a meeting of the World Musa Alliance, Guadeloupe, June 2023
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Partnerships, training and communication

Partnerships

An inauguration and a number of signings

During this exceptional year of celebrations, CIRAD was able to strengthen its partnerships in many fields and on a range of scales…

[January]

Inauguration of the Hydropolis buildings on the Lavalette campus

The new Hydropolis buildings on the Lavalette campus in Montpellier were officially opened on 17 January. Hydropolis is an ambitious project aimed at bringing together all the different water research capacities in Montpellier, and is a key component of the ICIREWARD International Centre, the first UNESCO centre for research and training on continental water in France, and one of the most important at the international level.

Second TSARA General Assembly

Launched in March 2022, the TSARA Initiative - Transforming Food Systems and Agriculture through Research in Partnership with Africa – including 22 members from African and French institutions across 14 different countries, held its second general assembly on 25 January in Saly, Senegal, under the co-presidency of the Agricultural Research Council (ARC) in South Africa and CIRAD. The event an opportunity to share key progress and validate the co-constructed scientific agenda and action plan, and formalize the governance for 2024, with INRAE (France) made co-president for a year. The initiative welcomed three new associate members: AgroParisTech (France), Institut Agro (France), and Gaston Berger University (Senegal).

[February]

A new COMP for 2024-2026

CIRAD signed a new Objectives, Means and Performance Contract (COMP) with its two line ministries* for the period 2024-2026. The contract confirms its scientific and partnership objectives in tropical and Mediterranean zones, France, Europe and elsewhere. It endorses a number of essential adjustments to allow the organization to respond better to the challenges of a constantly changing world, with additional resources allocated for the first time in response to those challenges.

[March]

CIRAD and EMBRAPA sign a new bilateral agreement building on more than 40 years of partnership

EMBRAPA President Silvia Massruhá and French Agricultural Research Centre for International Development (CIRAD) CEO Élisabeth Claverie de Saint Martin signed a memorandum of understanding reinforcing the partnerships between the two organizations in fields of strategic importance for the future of agriculture, notably in relation to climate change, sustainable development and food security.

[November]

CIRAD joins the World Flora Online consortium

CIRAD is now invited to World Flora Online (WFO) meetings, to represent the PI@ntNet consortium (INRIA, INRAE, IRD and CIRAD). This new collaboration marks CIRAD's commitment to global efforts to document plant biodiversity, given that 10% of plants worldwide are still little-known.

[October]

CIRAD and AFD strengthen their partnership

The French Agricultural Research Centre for International Development (CIRAD), the Agence française de développement (AFD) and its subsidiary Expertise France have gone one step further in terms of international cooperation by signing an ambitious framework agreement that for the first time includes another AFD subsidiary dedicated to the private sector: Proparco.

* The Ministry of Higher Education and Research and the Ministry for Europe and Foreign Affairs

Innovation and partnership

2024 was a fruitful year in every respect for scientific information and open science at CIRAD, marked by artificial intelligence, research data and cooperation in the global South. Focus on a project, a network and an anniversary…

Since the much-heralded advent of ChatGPT, artificial intelligence (AI) has been in the spotlight, and while controversial, AI tools are revolutionizing practices. The scientific information sector is no exception. Change is also under way at CIRAD as regards research data, with the creation in 2024 of a network to foster good scientific data management practice among different communities. Lastly, we were delighted to celebrate the 10th anniversary in 2024 of a scientific and technical information partnership with Burkina Faso.

Using AI for bilbliographical searches

The ISSA project (a 2022 CollEx-Persée-recognized project coordinated by CIRAD in partnership with INRIA Sophia Antipolis Méditerranée and IMT Mines Alès), which initially set out to respond to a need for automatic indexing of articles by keywords, rapidly took on more ambitious objectives. For instance, it has used various artificial intelligence techniques to analyse and index documents in an open scientific archive and subsequently offer innovative search and visualization services that can cope with complex bibliographic searches. Publications, deliverables and documentation are available on open access, allowing any interested community to take the tools on board. Part of the prototype developed by the ISSA project has been adopted and adapted by a CIRAD team (DiscO/DSI) to allow automatic indexing in CIRAD's open archive, Agritrop. Since January 2024, articles deposited in Agritrop have automatically been indexed by keywords taken from the FAO agricultural thesaurus, Agrovoc. This is a huge help for archivists and researchers. As well as saving time and boosting the volume of documents that can be processed, automatic indexing guarantees consistent indexing of all the articles deposited in Agritrop and means that information can be made available more rapidly.

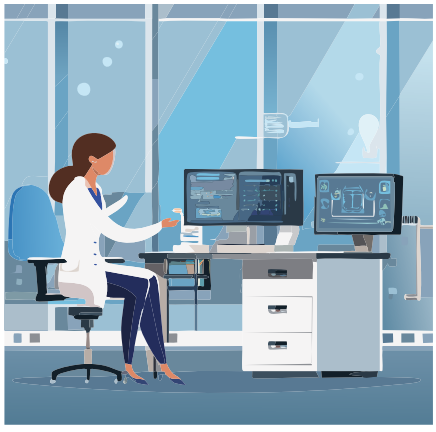


Illustration generated by AI using Adobe Illustrator

A "Data, codes and software" representative network

In 2024, CIRAD set up a network of data, source code and search software representatives, with the aim of encouraging virtuous management of the data, source codes and software the organization produces as part of its scientific operations. The group is coordinated by DiscO's research data policy support officer, backed by three colleagues from CIRAD's scientific departments. The CIRAD "Data, codes and software" network is working with its counterparts set up by the other organizations involved in its joint research units (INRAE, IRD, Institut Agro, CNRS, AgroParisTech, etc), and on a regional and national level with other research organizations, notably by means of data workshops (ECODOR in Occitanie).

Ten years of scientific and technical information collaboration with Burkina Faso

The scientific and technical information sharing network in Burkina Faso, ReMIST, was founded in 2013 by archivists and includes 16 structures (research centres, schools and universities). CIRAD began collaborating with ReMIST in 2014, starting with a facilitation workshop to foster scientific and technical information sharing between ReMIST's 40 members, organized by DiscO. The two organizations have since been working to consolidate the network by means of shared activities focusing on training, access to resources and promotion of open access. Since 2019, collaboration between scientific and technical information specialists from CIRAD and ReMIST has centred on operations linked to open science, including the rollout of CIRAD's "Libérez la science" (Free science) game as a teaching tool to disseminate good open science practice, a survey in Burkina Faso of scientists' practices in terms of open science, and the production of a travelling exhibition comprising ten posters to raise awareness of open science.

2025 will see new collaboration projects, notably centring on scientific information and research data management training. ■

anne.toulet@cirad.fr

ReMIST travelling exhibition on open science

A year of opening up and consolidation

In this year of celebrations for CIRAD, the dPs pursued their operations. Communication was centre-stage, and new dPs are currently emerging.

The "dP Days" were held on 27 and 28 June in the amphitheatre at Agropolis International in Montpellier. As in previous years, they brought together the partners involved in coordinating the dPs and a number of colleagues from CIRAD, including dP coordinators and staff from its regional offices, departmental management and heads of research units. For the first time, in 2024, they also included one promising junior researcher per dP (thanks to financial support from the CoMPAR project), and were opened up to priority research topic coordinators and value chain research coordinators, as part of the drive for transversality at CIRAD. To make the most of the exceptional presence of 40 partners, the agenda was extended across an entire week, with the aim of facilitating interactions between dPs and discussion and planning workshops to share experiences. Those workshops focused on the following topics: forest preservation and reforestation; pesticide reduction; promotion of agro-biodiversity as a solution to climate change; contributing to science diplomacy; mapping existing networks; facilitating entrepreneurial initiatives; and the terms of reference for dP evaluations.

One priority: visibility

In addition to the dP Days, which are vital, 2024 provided many opportunities to promote the dP network. For instance, it was presented to the members of the Agrinatura EEIG (European Economic Interest Grouping), international advisors from the French Ministry of Higher Education and Research, the members of the Agence française de développement's agriculture, rural development and biodiversity platform, the many participants in an international symposium organized by Laval University (Canada), and Heads of Department, metaprogramme leaders and international correspondents from INRAE.

The MALICA, SPAD and PP-AL platforms were highlighted in turn at CIRAD's 40th-anniversary celebrations in Brussels, Montpellier, and at a subsequent press conference. The MALICA and Amazonie platforms, via the ASSET and Sustenta e Innova projects, took part in the conference organized by CIRAD at DG INTPA in Brussels, on a retrospective analysis of the DeSIRA model. Lastly, the ASEA and GREASE platforms were promoted at the Franco-Chinese forum on agricultural education and scientific and technological cooperation in Wuhan.

New networks are emerging

The SALSA (Sustainability of Agricultural Landscapes in Southeast Asia) platform was inaugurated on 14 October 2024 at SEARCA in Los Banos, Philippines. It comprises six partners: UPM (Malaysia), UPLB (Philippines), INSTIPER (Indonesia), SEACA and ASAIHL (regional partners), and CIRAD.

Construction of the new Sol AfricaO (soil functioning and health in West Africa) platform is moving along well, following two major operations in 2024: a CIRAD-INRAE-IRD interdepartmental meeting and a second workshop on scientific aspects in Senegal. The consortium involves ten West African institutions in Benin, Burkina Faso, Ivory Coast and Senegal. It is the first platform in partnership that the three French organizations – CIRAD, INRAE and IRD – have all been involved in building. Funding in 2023 and 2024 was provided by INRAE, via the TSARA initiative, and CIRAD, via its incentive scheme.

Another platform is scheduled for 2025: TRACE (Transforming agriculture for Animal, Crop, and Ecosystem Health in the East African Rift). An initial meeting was held on line in 2024, involving ICIPE, CIRAD, IRD and East African organizations in Ethiopia, Kenya, Tanzania and Uganda. The platform will be largely funded by the East Africa Regional Multi-Actor Research Network consortium (RMRN-EA) due to be launched in early 2025. ■

tanguy.lafarge@cirad.fr

Launch of the SALSA platform (Philippines) © F. Bourg, CIRAD

The dPs, a novel type of scientific partnership

CIRAD and its partners have been building platforms in partnership for research and training (dPs) since 2009. They are long-term alliances with shared governance, fostering critical mass and interdisciplinarity. Shared research programming has resulted in a portfolio of projects, often funded following competitive calls.

The dPs in figures:

CIRAD is a member of **21** dPs

1000 people, including **154** on assignment from CIRAD

194 partner organizations

77 countries

3 international institutions

3 CGIAR centres

Building more sustainable banana chains, hand-in-hand with the private sector

CIRAD is building partnerships in the different banana production zones across the world, in the Caribbean, Africa, Latin America and elsewhere. It is one of the spearheads of the French sustainable banana initiative (IFBD) launched in 2023, and is working on a range of operations, including partnerships with the private sector, a major player in the sector's agroecological transition. CIRAD intends to continue its involvement in that transition and in its rollout across the various production zones, notably by building multidisciplinary knowledge. It is constructing innovation processes and partnerships with sectors at both ends of the value chain, in various production contexts worldwide, alongside public policymakers. For banana as for many other value chains, playing an active part in the agroecological transition also means proposing varietal solutions to emerging pest and disease challenges and climate change. Here too, CIRAD is working in partnership to address the issues at stake. It began by linking up with its Vitropic subsidiary, and went on to propose a public-private consortium (the World Musa Alliance - WMA) that aims to bring users on board on the long road from varietal breeding to widespread distribution of elite varieties across production zones. Private-sector partners from Africa, the Caribbean and central America joined the WMA in 2024. A novel partnership with the Lidl supermarket group in Colombia, launched in early 2024, is a prime example of CIRAD's operations. ■

Colombia

CIRAD and Lidl, partners working for sustainable bananas

CIRAD is supporting the Lidl group in a project to set up a pilot farm to produce bananas in a more sustainable way in Colombia. The project aims to cut pesticide use in the banana value chain, including that of Mancozeb, a fungicide used against black Sigatoka disease that has been banned in Europe since 2021. Interview with Marianne Naudin-Ait Said, Lidl France sustainable value chain expert, and Luc de Lapeyre de Bellaire, phytopathologist and Head of CIRAD's GECO research unit.

How did the partnership come about?

Marianne Naudin-Ait Said: CIRAD and Lidl have been working together since 2022. Originally, Lidl began by working with its suppliers on a "sustainable banana" roadmap. That was when we realized there was a need for support in terms of the value chain, and particularly the pesticides issue. For producers, obviously, but also for us, given the technicity of the issue and the distance between us and production zones. Our partnership started with a phytosanitary diagnosis of Lidl France's various sources of banana supplies. Our suppliers surveyed producers, based on their declarations, to determine the crop management sequences used in our supply chains in terms of pesticides. We then chose a pilot site for tests, which was using large amounts of pesticides (notably products banned in Europe) but with soil and climate conditions suitable that should allow for reduced use. The entire value chain was brought on board, with Tecbaco (a banana producer and exporter), AZFrance (an importer) and Lidl (a distributor).

Luc de Lapeyre de Bellaire: CIRAD was contacted around five years ago by post-production players in the sector interested in more sustainable sourcing. At the same time, we also decided to include a wish to promote the knowledge acquired through our innovation laboratory, the French West Indies, in the "Agroecology 1.0" ambition of our ten-year banana roadmap, while also having an impact on major banana production zones beyond the West Indies. Lidl's request therefore fitted in with our ambition. While we have traditionally worked more with producers, we now believe that ensuring impact means working with the entire value chain (including downstream elements).

What are the specificities and strong points of the partnerships, and its future prospects?

M.N.: One of the project's specificities is that we co-constructed our roadmap with our partners. This probably explains why so many producers have taken the proposed new techniques on board: they do not see them as restrictive. We are keen to pursue the work started with Tecbaco, which currently only concerns 96 of the 9000 ha managed by the firm. In terms of the IFBD in France, we hope to have a spillover effect on producers and on the French banana sector as a whole, by demonstrating that it is possible to make progress and to bring all the players in the value chain on board. CIRAD has become a trusted partner for Lidl as regards banana and exotic fruits.

L.L.B.: One of the most positive aspects of this partnership is Lidl's determination to be a force for change in the upstream links in the value chain. It is a very rewarding partnership, which tallies with our ambition to have an impact on the entire chain. At CIRAD, notably via the PRETAG initiative, we are keen to foster "living labs", real laboratories that serve to prove that the value chain can transition. The pilot farm in Colombia is a great example. ■

Since 2020, Cirad'Innov® has offered solutions for the entire range of stakeholders – start-ups, SMEs and large groups, professional federations, NGOs, territorial authorities and public agencies – that can make direct use of them.

Towards a new strategy

CIRAD attaches considerable importance to building research capacity by transmitting academic and professional knowledge. The recent strategy revision (three-year Objectives, Means and Performance Contract [COMP] agreed with the French State in February 2024) was an opportunity for a shift in training strategy.

With its new COMP, CIRAD is reaffirming its ambition to provide training in the global South, for the global South and with the global South, which is now a transverse lever for building capacity both at CIRAD and among its partners through mutual learning (joint research and training). The new training roadmap is due to run until late 2026. It comprises three main components:

- Professionalizing training, scientific and support players, to guarantee the quality and relevance of training operations;
- Building innovative teaching methods to adapt to a changing context and encourage new types of learning to foster student motivation;
- The impact of training on the long-term changes beneficiaries make to their practices, to go beyond mere knowledge transmission and fit into the research-training-development continuum.

2024 saw several types of capacity building operations and knowledge exchanges. Research training through thesis supervision is the main practice for researchers in both North and South. CIRAD remains attractive to students wanting to prepare their thesis, and the number of PhD students supervised or co-supervised is stable, at around 440. However, if one looks at nationalities, the proportion of candidates from the global South is continuing to rise, and has now reached 64%. Summer schools have also proved to be a good way of combining research and training. Some 30 Masters and PhD students in Argentina and Brazil were able to acquire interdisciplinary knowledge and familiarize themselves with tools for analysing the socio-environmental issues surrounding water management, thanks to a summer school devoted to territorial challenges for water governance in semi-arid regions at a time of shortages. ■

magali.dufour@cirad.fr

CIRAD, an experienced professional training provider: feedback on 2024

Each year, CIRAD opens up some 30 training sessions to outside participants. Some of those sessions have become essential references. Two examples are the session on economic and financial instruments for the climate and biodiversity led by CIRAD economist Alain Karsenty, which in 2024 attracted almost 40 participants, and the cocoa sessions organized by Sophie Assemat, sensorial analyst with CIRAD, which are consistently fully booked.

Interview with Alain Karsenty, educational leader of the training course in economic and financial instruments for climate and biodiversity

RR

How did this training come about?

Alain Karsenty: We built the training proposal in 2015, at Climate COP21 in Paris. The Instituts français (French Councils) in Gabon, Cameroon and Madagascar agreed to fund two- or three-day training sessions on international talks and economic instruments for climate mitigation, which I provided on my own. Then I thought it would be a good idea to broaden things out to encompass biodiversity, and to take account of the legal issues surrounding the main international climate and biodiversity conventions. I suggested to a legal colleague that she cover the legal aspects, and to a fellow economist that she cover the main issues relating to adaptation to climate change. For "green funding" aspects, we called on a specialist working for the Green Climate Fund. The 2025 edition will focus less on international talks, and more on economic, legal and financial instruments. The audience is quite varied: we've had requests

from both France and French-speaking Africa. It includes people working for environmental NGOs, project design offices, development and environmental projects or in research, and also government officials. They are all keen to understand or to improve their understanding of instruments such as carbon markets, payments for environmental services, genetic resource rights or ecological taxation, for instance. Over the years, this course has built a solid reputation. The 2024 edition was fully booked, and 2025 looks set to be the same.

Interview with Sophie Assemat, educational leader of CIRAD's cocoa training courses, and Frédéric Aigle-Boucher, General Manager of Beussent Lachelle, a chocolate maker, who took a course on how to become a cocoa expert in 2024.

Le journal de l'île

CIRAD

Sophie Assemat

How did this training come about?

I started these courses in 2002, and since then we have trained more than 600 professionals from every continent. The courses were tailored to the expectations of stakeholders in the cocoa and chocolate sector and to how the changes in the sector over the past 20 years, looking at different production and processing methods (producers, bean to bar, bean to tree, industry, artisan chocolate makers, etc). Sensorial analysis is a valuable tool and a common thread running through cocoa production and processing.

What was the logic behind the proposed training programme?

For students to learn about cocoa product sensorial quality at the different production and processing stages (qualities and defects), and be able to understand, describe (using the appropriate vocabulary), discriminate between and define organoleptic characteristics. The three modules that make up the full programme are designed to allow participants to make steady progress.

Frédéric Aigle-Boucher

What did you take away from the training?

Beussent Lachelle did two modules led by Sophie Assemat, on cocoa and chocolate sensorial analysis and cut-tests, and advanced cocoa and chocolate sensorial analysis. Both were fascinating, thanks to Sophie's knowledge, teaching skills and people skills. We now have a better understanding of the importance of each stage in chocolate production, from bean harvesting to storage through fermentation, drying, roasting and conching. This has been really useful, as our firm's operations go all the way from growing cocoa to selling chocolates. We skimmed over the importance of all those phases, but went into more detail when necessary (and if time allowed). Several members of our staff have done this training, several times in some cases, and even those of us who were sceptical to start with were won over in the end.

What changes have you made as a result?

The training taught us what we can observe or do empirically, provided we have sufficient scientific knowledge. In very basic terms, it has allowed us to improve our processes, our work as a whole, and our products. Our customers are also very grateful to Sophie!

frederic.diez@cirad.fr

CIRAD alumni

In 2024, CIRAD launched an "Alumni du CIRAD" (CIRAD alumni) group on the France Alumni platform run by Campus France. Any scientist who has worked at its installations and sites is classed as a CIRAD alumnus, to allow them to network or simply keep in touch with their peers. Since 1993, more than 6500 people of every nationality have spent time in CIRAD's research units. Whether for a few weeks or several years, CIRAD receives some 800 people a year, many of them from overseas. France Alumni is an open community that facilitates interactions between individuals from various fields and organizations.
In 2025, CIRAD intends to work even harder to encourage people to join the group and to organize events to bring together communities with similar geographical interests, in partnership with other research and higher education establishments in France and elsewhere.

gabriel.denis@cirad.fr

francealumni.fr

FRANCE ALUMNI

Communication

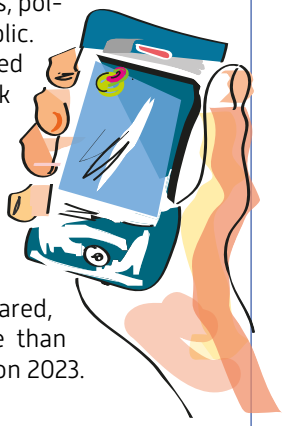
CIRAD's 40th anniversary: the highlights

The Communication Office's activities in 2024 centred on CIRAD's 40th anniversary. In France and at its regional offices in the French overseas regions and elsewhere, a number of events and products marked the organization's 40 years of innovation, impact and partnerships, with a central slogan: "Shared research to grow the world of tomorrow".

2024 was largely devoted to celebrating CIRAD's 40th anniversary, although other products were not sidelined. To mark the anniversary, the CIRAD podcast, *Nourrir le vivant* (Feeding the living world), looked at some of the main issues facing the world of agriculture, including crop biodiversity, carbon credits and land use conflicts. In both the global South and the global North, agriculture is changing, and the six insightful podcasts released in 2024 looked back at the past with a view to building a better future.

CIRAD on social media: a more engaged community

CIRAD's social media community continued to grow in 2024, with 20 342 new followers on Facebook, Instagram, LinkedIn, X and YouTube. The latest total is 158 568 followers, a 14.7% increase year on year. On a daily basis, CIRAD shares news, press releases, podcasts and videos to promote its scientists' work and communicate with donors, policymakers, partners and the general public. For its 40th anniversary, CIRAD published a series of social media posts looking back at key moments in its history and its contributions in the fields of agriculture, the environment and health. In all, there were 170 original posts between April and December 2024, with more than 760 000 impressions and 65 000 engagements. More than 1021 posts were shared, with 3.3 million impressions and more than 165 000 engagements, a 49% increase on 2023.



An excellent media presence

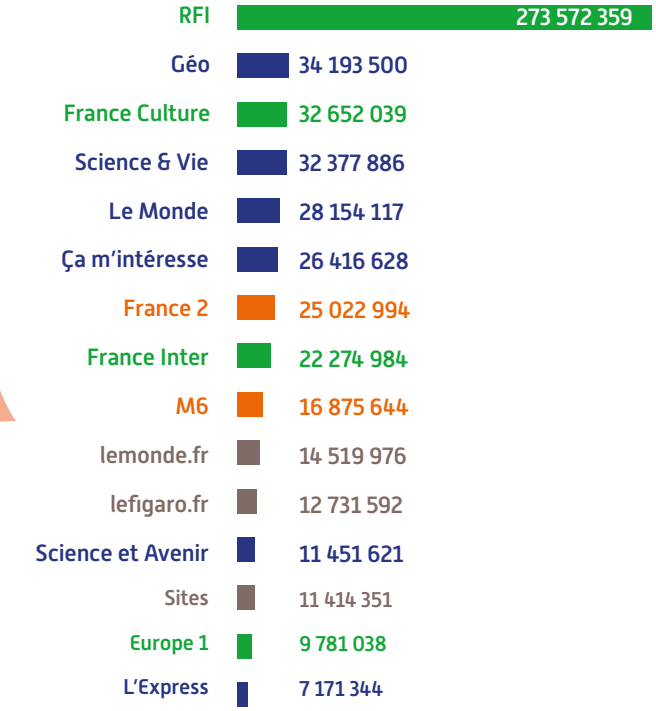
In terms of the media, 2024 saw good coverage for CIRAD during Biodiversity COP16 in October – and to a lesser extent at Desertification COP16 and the Paris International Agricultural Show – and during President Macron's trip to Brazil, accompanied by CIRAD's CEO, in late March. In all, there were 600 examples of quality media coverage in 2024, and a total of 3500 online mentions of CIRAD worldwide.

Efforts to boost media coverage also centred on CIRAD's 40th anniversary, focusing on promoting its historical expertise. A series of five articles was published in partnership with *The Conversation,* on food security, tropical forests, water management, genetic diversity and plant modelling. The photographic exhibition produced for CIRAD's 40th anniversary, launched at the Botanical Gardens in Montpellier, was widely covered in the local media, notably on radio and television.

A series of four video reports, *Les nouvelles d'Afrique* (news from Africa), was filmed and edited by a production company and shown several times on the TV5 Monde channel, showcasing the progress made by projects funded by the DeSIRA programme and the Agence française de développement.

Again in relation to this anniversary year, a partnership was sealed with the *Le Monde* newspaper, which published a two-page spread on CIRAD and its work in partnership in Senegal and Vietnam on the day of an anniversary conference held in its auditorium, looking at how to feed the planet in 2050 without destroying it. An RFI radio show with some of the conference's overseas guests was recorded the following day.

Audience impact of 600 mentions of CIRAD in the French-speaking media, per outlet:

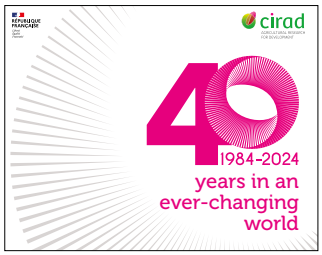


CIRAD document library

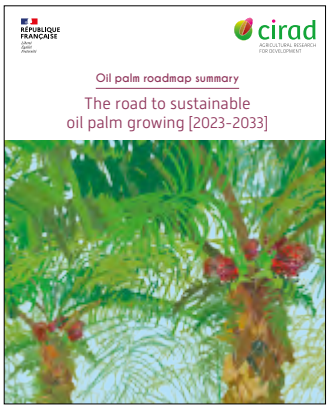
Communication

A brochure and a series of roadmap summaries

Throughout the year, a specific page on the cirad.fr website reported on the products, events and meetings organized as part of CIRAD's 40th anniversary celebrations. A lavishly illustrated brochure entitled "40 years in an ever-changing world", looking at the organization's history through its results, impacts and partnership, and at its prospects, was released in English, French and Spanish. It includes an original series of interviews with a number of CIRAD's partners.



The year was also marked by the publication of two roadmap summaries, on palm oil and dairy, and editorial coordination of the first ImpresS Evaluation Report 2020-2024. These documents are available in both English and French.



Events-led celebrations

The anniversary celebrations were launched on 25 June in Montpellier, with the public opening of the large-format photographic exhibition in the Botanical Gardens and an event for CIRAD's community of partners and employees at the city's Corum Centre. The event, in a hybrid format, was an opportunity for CIRAD to showcase the impact of its research in partnership with the countries of the global South, in the fields of agriculture, the environment and health. Towards the end of the year of celebrations, in the afternoon of 25 November, CIRAD organized two events in Paris: an institutional gathering during which AFD Group and CIRAD extended their framework agreement (2024-2028), followed by a public conference on the topic of "Feeding the planet in 2050", in partnership with the Le Monde newspaper. Across the year, CIRAD also took part in several recurrent events: the International Science Festival, the Paris International Agricultural Show, and the Sud de Sciences Festival. On an international level, it co-organized the fourth Rencontres Francophones Légumineuses (RFL4) in Dakar, Senegal, in January and the 23rd European Society for Vector Ecology Conference (E-SOVE) in Montpellier in October. It also took part in Biodiversity COP16 and Climate COP29.

The Montpellier botanical gardens hosted a month-long photographic exhibition on CIRAD's activities © P. Doucet, CIRAD

In-house communication: festivities and reflection

In 2024, CIRAD's in-house communication took up the challenge of making its 40th anniversary the common thread for the year. Every event was designed to share its history and values. The annual gathering of its employees in July was taken to a new level with nine new events, art exhibitions and a journey through CIRAD's history, and a highlight: a concert including a group rendering of a CIRAD anthem written for the occasion, a strong symbol focusing on our values of solidarity and innovation. The autumn saw the start of a new cycle of debates, the Agoras du CIRAD, on strategic topics such as the agroecological transition, decolonization, development and the history of tropical value chains. With prestigious contributors like Bertrand Badie and Alexander Wezel, these exchanges have fuelled an essential debate on the organization's future. Similarly, the Journées d'intégration for new recruits immersed them in CIRAD's history, through a series of testimonials from emblematic figures. With more than 120 intranet news items, in-house communication punctuated a year focusing on transmission, dialogue and promotion of CIRAD's scientific and human heritage. ■

Publications

2024 was rich in various types of publications, for CIRAD and its partners: scientific books and studies, reports and graphic accounts all served to promote our research.

Co-publications

Foresight to benefit food systems

The Food and Agriculture Organization of the United Nations (FAO) and CIRAD published a report entitled *Shaping sustainable agrifood futures: pre-emerging and emerging technologies and innovations for impact*, with a full analysis of 32 promising technologies and innovations.

Shaping sustainable agrifood futures: pre-emerging and emerging technologies and innovations for impact – An extended global foresight report with regional and stakeholders' insights, N. Alexandrova-Stefanova., K. Nosarzewski, Z.K. Mroczek, S. Audouin., P. Djamen, N. Kolos, and J. Wan 2024. FAO, Rome, and CIRAD, Paris, 292 p.

Participatory approaches to preserve the planet

The authors of *Transformative Participation for Socio-Ecological Sustainability – Around the CoOPLAGE pathways*, a book coordinated by INRAE and CIRAD, present their participatory approaches for helping players co-construct solutions and policies tailored to current socioecological challenges.

Transformative Participation for Socio-Ecological Sustainability, around the CoOPLAGE pathways, Emeline Hassenforder (editorial coordination), Nils Ferrand (editorial coordination), Editions Quae, Update Sciences & Technologies collection, April 2024, 270 p.

Andhra Pradesh, an agroecology laboratory

A new book co-published by FAO, CIRAD and the RySS presents the first macroeconomic scenario for a full transition to agroecology (AE) by 2050. The scenario was built for Andhra Pradesh, a state in southern India with a population of 53 million and 9.3 million farmers in 2020.

Agro-industry versus agroecology? Two macroeconomic scenarios for 2050 in Andhra Pradesh, India, B. Dorin, A.-S. Poisot., T. Vijay Kumar 2024, CIRAD, France, FAO, Italy, Rythu Sadhikara Samstha (RySS, India), 140 p.

Participatory research and innovation

In collaboration with Agrinatura, CIRAD has published an initial compilation of 12 stories of change relating to the DeSIRA initiative funded by the European Union.

Activating agricultural transitions to sustainability through participatory research and co-innovation. Stories of change across Africa, Asia and Latin America from de the DeSIRA initiative, A. Toillier, R. Guillonnet, A. Dolinska, P. Henriquez, M. Perez, M. Lima de Faria, eds., CIRAD, France, 2024, 76 p.

Guidance notes and reports

A plea for territorial approaches

Territorial approaches promote more inclusive sustainable development, bring together multiple SDGs and provide a concrete methodological pathway to overcome isolated approaches. This white paper by the "Territorial Perspective for Development" group (TP4D) is aimed at development policymakers, donors, and practitioners.

Territorial approaches for sustainable development. White Paper for Policy Formulation and Project Implementation. TP4D, 5 p.

More publications on

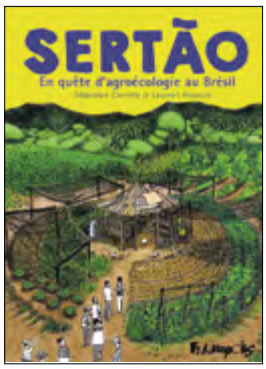
https://partage-connaissances.cirad.fr/en

https://www.quae.com/

Publications

Works for the general public

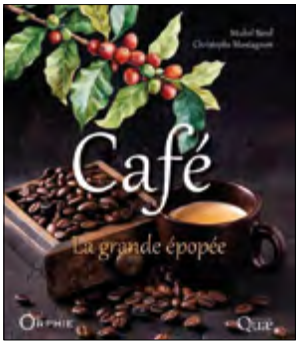
A cartoon explaining agroecology in Brazil



Sébastien Carcelle, an anthropologist from CIRAD, has turned the ethnographic survey he did as part of his PhD into a captivating cartoon strip. The book, entitled *Sertão*, was published by Futuropolis in September, and is a human, political and ecological journey through agroecology in Brazil.

Sertão. En quête d'agroécologie au Brésil, S. Carcelle, L. Houssin, Editions Futuropolis, September 2024, 224 p.

All you ever wanted to know about coffee



This book takes its readers on a fascinating trip through the world of coffee, from its origins to processing, looking at the entire value chain for this universal beverage.

Café, la grande épopée, M. Barel and C. Montagnon, Editions Quae, Beaux livres collection, October 2024, 128 p.

Scientific works, journals and studies

For sustainable logging of tropical forests

At a time when tropical forest deforestation and degradation are threatening biodiversity and the climate worldwide, the author, who is Head of CIRAD's Forests and Societies research unit, offers an in-depth analysis of the environmental impacts of logging and suggests ways of making it more sustainable.

Exploiter durablement les forêts tropicales, P. Sist, ditions Quae, August 2024, 100 p.

26 years of research on soil fertility in sub-Saharan Africa

To mark the 2024 Paris International Agricultural Show, the journal *Cahiers Agricultures* published an issue tracing the changes in research on soil fertility management in sub-Saharan Africa, via a selection of articles published between 1998 and 2024.

Gestion de la fertilité des sols en Afrique subsaharienne, recueil d'articles publiés de 1998 à 2024, P. Dugué, Ch. Rawski. *Cahiers Agricultures,* 2024, 46 p.

Preparing better for environmental and food crises

This collective work suggests thinking outside the box to overcome environmental and food crises, including making use of the philosophical concept of non-coincidence.

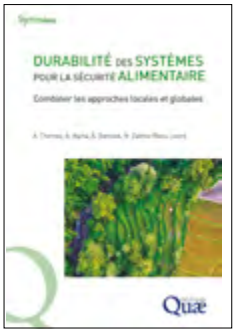
Une recherche dé-coïncidente pour se préparer aux crises environnementales et alimentaires, C. Lejars and S. Marette (scientific coordination), Editions Quae, July 2024, 164 p.

Interdisciplinarity to benefit water research

Eleven original eyewitness accounts from researchers, illustrating concrete ways of practising interdisciplinarity with a view to building engaged research on water and its role in society.

Récits de recherche sur l'eau dans un monde interdisciplinaire, scientific coordination: A-L. Collard, J. Riaux and M. Kuper, Editions Quae, Indisciplines collection, August 2024, 171 p.

Combining local and global approaches for sustainable food systems



A French translation was released in 2024 of a book published in English in 2022, presenting recent research findings from many disciplines obtained on a number of different analysis scales, combining local and global food security approaches.

Durabilité des systèmes pour la sécurité alimentaire, combiner les approches locales et globales, A. Thomas (scientific coordination), A. Alpha (scientific coordination), A. Barczak (scientific coordination), N. Zakhia-Rozis (scientific coordination), Editions Quae, Synthèses collection, January 2024, 246 p.

Ethics, SD and SR, key figures and organization

ethics in common

New leaders and a new guidance document

The INRAE-CIRAD-IFREMER-IRD Ethics in Common Committee addresses the ethical issues that may be raised by research in France and overseas, in the fields of food, agriculture, the sea, the environment and sustainable development, particularly those that concern the relationships between science and society.

2024 saw the end of the mandates of Michel Badré (President) and Bernadette Bensaude-Vincent (Vice-President) on the Ethics in Common Committee. To replace them, the CEOs of the four organizations appointed Patrick du Jardin (agronomist, University of Liège) and Valérie Masson-Delmotte (paleoclimatologist, CEA) on 4 April.

Meetings and statements

Among its interactions with other ethics committees, the Ethics in Common Committee helped to organize a joint day of meetings with the CNRS Ethics Committee (COMETS) on the topic of scientist engagement. As President of the Committee, Patrick du Jardin also contributed to the fourth edition of the institutional ethics committee meetings organized by the French national consultative committee on ethics (CCNE), on the topic of ethics, innovation and progress.

In June, the Committee issued its 16th guidance document, on the "Exploration, exploitation and preservation of pristine and minimally anthropized environments. The deep seabed : a case in point". The document, prompted by questions relayed by IFREMER (hence the case study of the deep seabed), also applies to any research relating to environments that are difficult to access or largely unaffected by human activity, such as temperate or tropical primary forests or polar regions. The Committee encourages researchers to reflect on the notion of the "stakes for knowledge" and on the consequences of its acquisition, allowing for the diversity of issues raised by the various players involved in or concerned by research. It also calls for the definition of a legal status to protect minimally anthropized environments by virtue of their intrinsic value, not merely with a view to their potential exploitation.

A group of researchers from CIRAD, INRAE, and IRD also requested the Committee's opinion on the subject of research partnerships with Israeli organizations and firms in the light of the conflict in Gaza. In its response, issued on 14 November, the Committee recommended that scientists from every project reflect individually and collectively on the pursuit of the common good. It also issued a reminder of the role of research in dialogue between countries and peoples.

Self-referrals

Continuing the work begun in 2023 on a self-referral concerning participatory research and science, the Committee conducted new interviews of individuals and groups from the four organizations, and from other establishments. A trip to Bordeaux on 18 and 19 November allowed its members to hold in-depth, fruitful talks with teams at the Pierroton site and the Grande Ferrade centre (INRAE) working to develop and roll out such approaches. The resulting guidance document is currently being finalized and will be published in 2025.

Alongside this, plans have taken shape for another self-referral on the ethical issues surrounding research on and for adaptation to climate change. A working group has been set up within the Committee to draft a context map and lead the reflection. ■

estelle.jaligot@cirad.fr

Find out more

Ethics in Common website:

Download guidance document no. 16:

Sustainable development and social responsibility

Sobriety remains the watchword

It is absolutely vital that we cut greenhouse gas emissions, and CIRAD is doing its utmost to achieve carbon sobriety. At the same time, it is working to guarantee better working conditions for its employees: respect for the environment goes hand-in-hand with respect for people.

The year 2024 was spent drafting our seventh greenhouse gas balance report, based on 2023 data. This edition of the report, produced every three years since 2005, saw a major change in scope with three new emissions categories – "purchases", "fixed assets" and "home-work commuting" – now also being assessed. Four emissions categories combined account for 90% of our total emissions, in order of importance: purchases, professional travel (emissions largely due to air travel), fixed assets and energy consumption. The report is due out in early 2025. CIRAD's latest Objectives, Means and Performance Contract (COMP) sets a target of a 6% reduction in emissions by 2026, compared to 2023. The reduction strategy for the period centres on cutting emissions due to air travel and energy consumption. The other main categories are also being targeted, but the corresponding accounting methods will be fine-tuned during the period covered by the COMP.

Long-term modelling of our low-carbon trajectory: Act'Sup project

The Act'Sup project began in October 2024. It comes under the ADEME collective programmes to accelerate the climate transition step by step, which help the members of a consortium from a given sector of activity to build their long-term low-carbon strategies across the range of emissions categories. Act'Sup is co-headed by a group set up to integrate the concept of social responsibility into the higher education sector in France, and is providing 14 higher education and research establishments with individual help to build their low-carbon strategies, along with collective assistance in the form of events, workshops and work sessions.

Eco-design of research and development projects

Following on from the 2018 research operation centring on a multi-criteria environmental assessment (life cycle assessment or LCA) of our organization, to understand the environmental impacts of our activities, the Starlet budget analysis tool for project environmental assessment was developed. This was followed in 2024 by a Masters course (currently being finalized) on the analysis of contexts and possibilities in terms of research and development project eco-design, focusing on an analysis of in-house players and processes, along with current donor guidance. CIRAD submitted an application in late 2024 following a call from ADEME, with a view to pursuing this dynamic through concrete action.

"2tonnes workshops"

Social responsibility is now an integral part of the CIRAD Human Resources Service's training plan. A number of in-house 2tonnes workshop leaders from CIRAD have been trained, to ensure the concept's widespread adoption. 2tonnes workshops encourage participants to work as a team to look into the future and attempt to mitigate climate change in order to achieve a figure of 2 tonnes of CO2e greenhouse gas emissions per person, per year, by 2050. To enable a systemic understanding of the issues, the workshops take account of the individual and collective dimensions of the topic, along with the role of influence, a key factor in societal transformation. They are intended for both climate novices and experts, and are a real "serious game", designed to bring people together to discuss the issues and allow them to express themselves freely.

"Employeur Pro-Vélo" label

CIRAD has joined the *Employeur Pro-Vélo* (Pro-Cycle Employer) scheme, to encourage its employees to cycle to work. The label recognizes employers taking ambitious, cycle-specific actions in line with the specifications drafted by the French cycle users' federation. Five types of actions are required to obtain the label, which has three levels (gold, silver and bronze): organization and strategy; communication and incentives; cycle services; safety; and equipment. CIRAD obtained the silver label in 2024.

Energy sobriety

CIRAD has continued to take concrete steps to achieve the targets set for its 2024 energy sobriety plan, and has begun considering "tertiary building performance". Consumption in Montpellier is now analysed per building and per usage category, to pinpoint areas where savings could be made. CIRAD received new grants in 2024 following a call for environmental transition projects (€ 2M in 2024). The main outlines of its energy blueprint (SDE) between now and 2030 have been drawn, notably including continued reductions in its energy consumption and carbon footprint.

The CUBE (efficient building usage) challenge is a competition open to all French State services and operators, with the aim of maximizing energy savings by mobilizing the people in those buildings. In 2023, CIRAD embarked on CUBE with a pilot building (B building on its Baillarguet campus). Its Installations and Maintenance Service (Ditam) organized a day of activities focusing on energy on the Baillarguet campus on 28 May. A 10% saving on energy consumption was achieved following the operation, compared to the average for the previous three years, putting CIRAD 54th out of 184 participants. Two new buildings embarked upon the challenge in 2024.

Sustainable development and social responsibility

Quality of life and working conditions: CIRAD is pursuing its commitment

Work-life balance, supportive management, ensuring that employees feel useful, a culture of inclusion, working from home, health protection, infrastructure security… the list of ways of improving quality of life and working conditions (QLWC) goes on. CIRAD launched a survey in 2022 to understand its employees' needs and expectations. The results pinpointed its strong points, along with the fields requiring sustained action, those requiring new action, and those requiring monitoring.

In 2024, the QLWC Steering Committee set up four participatory working groups of staff representatives, to look into the four main areas in which the survey considered there was room for improvement: management, expatriation, recognition, and values. The groups have been tasked with drafting concrete action plans by late 2025.

The direction of the QLWC project, which was entrusted with this operation under CIRAD's Sustainable Development and Social Responsibility Blueprint and Objectives, Means and Performance Contract, is now clear, and the project benefits from a collective desire to make progress. The survey and working groups will enable CIRAD to draft a clear roadmap for improving its employees' quality of life and working conditions and guaranteeing a more pleasant working environment for all.

A dynamic year for the RespIRES project, at the nexus between ecology and QLWC

Numerous staff members at higher education and research establishments in Montpellier are involved in the RespIRES project on the responsibility of research institutes in terms of ecological and social issues, coordinated by CIRAD and scheduled to run from 2023-2025. It aims to foster changes in professional practice while taking account of quality of life and working conditions. In 2024, new workshops were organized as part of a cycle on "the scales of transition", focusing on the levers for and difficulties of transition, eco-emotions and environmental ethics, along with a conference and a pilot training module in eco-emotion management. In late 2024, a national exploratory study was launched within French research and higher education establishments, to assess the impact of climate change and the ecological transition on staff working conditions and health. ■

cathy.grevesse@cirad.fr

The progress made by the project in 2024 is set out on www.projet-respires.org

Key figures

SCIENCE

Number of articles published*

* Source Agritrop, figures as of 31 January 2025

705 in peer-reviewed journals, including:

390 co-published with partners from the global South

510 with open access

16 projects helped to boost impact by impresS (Impact of Research in the South)

7 monitoring and assessment operation

10 training sessions

PARTNERSHIP

Number of senior scientific staff members on assignment outside mainland France in 2024 (in FTEs*)

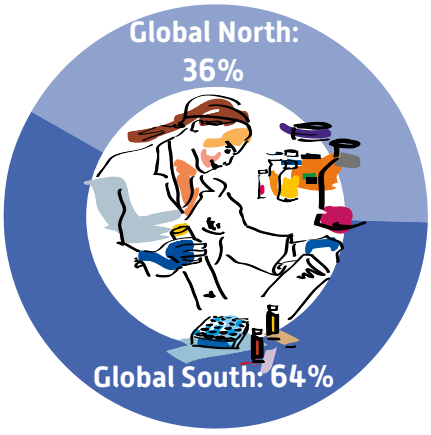
* FTE: full-time equivalent Source: SIRH-DGDRD, as of 31 December 2024

French overseas regions	Africa	Asia and Oceania	Americas and Caribbean	Europe	Total
152 FTEs	129 FTEs	33 FTEs	31 FTEs	5 FTEs	350 FTEs

21 dplatforms in partnership for research and training
with national and international institutions in tropical and Mediterranean countries

TRAINING

440
PhD students supervised or co-supervised by CIRAD in 2024



279 interns

Source: SIRH -DGDRD

Key figures

PROJECTS

CIRAD manages a portfolio of **940 active multi-year projects**

In 2024, **339 projects** were signed:

29% with public research donors

24% with public development donors

27% with private donors

20% with overseas territorial authorities

92 new project agreements signed with socioeconomic players

IN A NUTSHELL

CIRAD employs

1750 people,

including **1200 scientific staff members,**

of whom **850 are researchers**

85/100 INDEX ÉGALITÉ FEMME HOMME

RÉPUBLIQUE FRANÇAISE

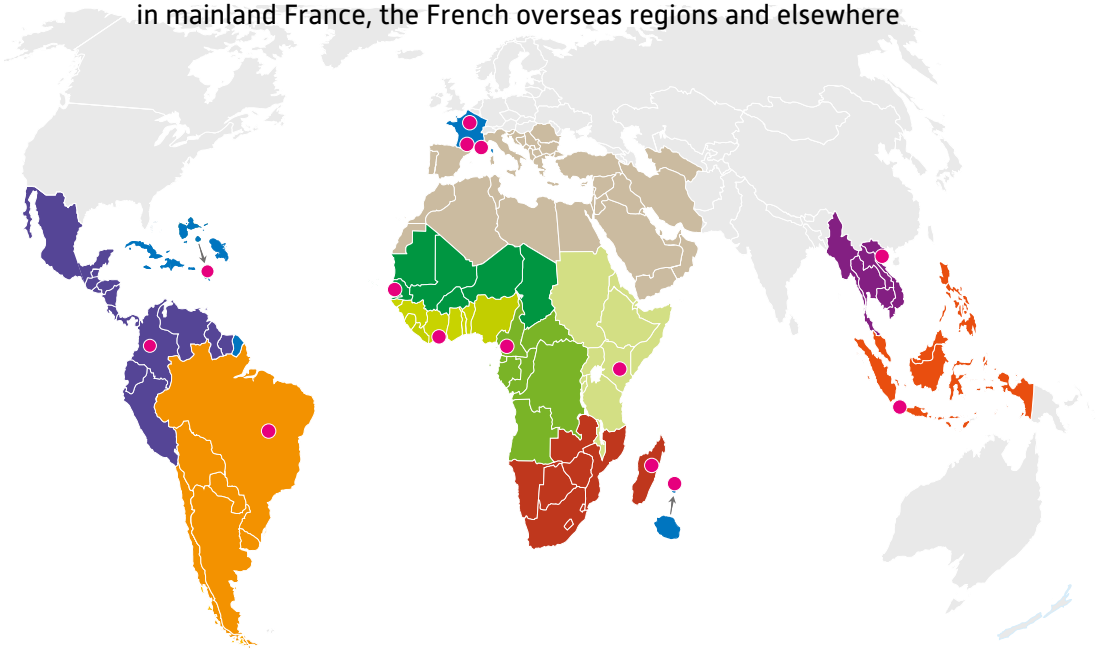
* French State gender equality score

Annual budget

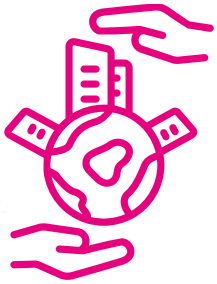
250 M €

14 regional offices

in mainland France, the French overseas regions and elsewhere



200 partner institutions



Organization chart (as of 31 December 2024)

Advisers to CEO
Thierry LEFRANÇOIS
Nadine ZAKHIA-ROZIS

Communication Office
Marie-Laurence POUXVIEL

Evaluation Systems Office
Jean-Michel VASSAL

Public Affairs Office
Émilie KLANDER

Board of Trustees

Chair
Élisabeth CLAVERIE DE SAINT MARTIN

Regional offices overseas
Central Africa: **Thierry LEROY**
East Africa: **Patrice GRIMAUD**
Southern Africa and Madagascar: **Jean-Marc BOUVET**
West Africa - Dry zone: **Ibra TOURÉ**
West Africa - Forest and Humid Savannah: **Serge MARLET**
Continental Southeast Asia: **François ROGER**
Southeast Asian islands: **Jean-Marc RODA**
Brazil and Southern Cone Countries: **Pierre MARRACCINI**
Mediterranean, Middle East and Balkan countries: **Sandrine DURY**
Mexico, Central America and Andean countries: **Philippe VAAST**

Research Impact and Marketing Service
Alain BILLAND

Partnerships Office
Tanguy LAFARGE

Europe Office
Inese ROZENSTEINE

Quality, Social Responsability and Research Infrastructures Office
Cathy GREVESSE

Tropical Supply Chains Office
Alexia PRADES

Scientific Information and Open Science Office
Anne TOULET

Incentive Operations Office
Sasha LEGRAND VALDES

Board of Directors

Director General in charge of Research and Strategy (DGD-RS)
Philippe PETITHUGUENIN

Directors of Scientific Departments

Biological Systems Department (BIOS)
Delphine LUQUET

HEADS OF RESEARCH UNITS

BIOS

UMR AGAP
Claire BILLOT

UMR AMAP
Raphaël PÉLISSIER (IRD)

UMR Astre
Nathalie VACHIERY

UMR CBGP
Renaud VITALIS (INRAE)

UMR DIADE
Yves VIGOUROUX (IRD)

UMR INTERTRYP
Philippe SOLANO (IRD)

UMR PHIM
Jean-Benoît MOREL (INRAE)

UMR PVBMT
Bernard REYNAUD (University of Réunion)

UMR: Joint research unit
UPR: Internal research unit
US: Service unit

Organization chart (as of 31 December 2024)

INRAE-CIRAD-IFREMER-IRD
"Ethics in Common" Committee
Chair **Patrick DU JARDIN**

Ethics and Research Integrity Office
Estelle JALIGOT

Science Council
Chair **Gilles KLEITZ**

Works Council (CSE)
Secretary **Pierre DEFAUT**

Director General in charge of
Resources and Organization (DGD-RD)
Anthony FARISANO

▼
Performance of Tropical Production and Processing Systems Department (PERSYST)
Éric JUSTES

▼
Environments and Societies Department (ES)
Claire CERDAN

▼
PERSYST

UPR AIDA
Jullien DEMENOIS

UMR ABSYS
Bruno RAPIDEL

US Analyses
Marie TELLA

UPR BioWooEB
Jean-Michel COMMANDRÉ

UMR Eco&Sols
Laurent COURNAC (IRD)

UPR GECO
Luc DE LAPEYRE

UPR HortSys
Fabrice LE BELLEC

UMR ISEM
Nicolas GALTIER
(University of Montpellier)

UMR QUALISUD
Sabine GALINDO

UPR Recycling and Risk
Frédéric FEDER

▼
ES

UMR ART-Dev
Denis PESCHE

UMR CIRED
Franck LECOCQ (Agro Paris Tech)

UMR ECOFOG
Stéphane TRAISSAC
(AgroParis Tech)

UPR F&S
Plinio SIST

UMR G-EAU
Marcel KUPER

UMR INNOVATION
Ronan LE VELLY (Institut Agro)

UMR MOISA
Paule MOUSTIER

UMR SENS
Philippe MÉRAL (IRD)

UMR SELMET
Guillaume DUTEURTRE

UMR TETIS
Pierre MAUREL (INRAE)

See the list of research units with full names on page 60

Regional Offices in mainland and overseas France
Île-de-France: **Anthony FARISANO**
Montpellier – Occitanie: **Vincent FABRE-ROUSSEAU**
French West Indies, French Guiana and Caribbean: **Magalie JANNOYER**
Réunion, Mayotte and Indian Ocean: **Éric JEUFFRAULT**

Accounts and Finance Service
Thierry COULOUMIES

Human Resources Service
Aurélie BOTTA

Installations and Maintenance Service
Arthur GOUBET

Information Systems Service
Laurence ROUSEAU

Legal Affairs and Compliance Office
Alexandrine REY

Health and Safety Office
Tiffany GASTINEAU

Archives Office
Yann COMBOT

Procurement Office
Malaurie SALLES

Performance and Internal Auditing Office
Fabienne KNOEFLIN

Head of Security and Defence

General organization (as of 31 December 2024)

BOARD OF TRUSTEES

Chair
Élisabeth Claverie de Saint Martin

Oudi Serva (alternate: Loïc Biwand), representing the Ministry of French Overseas Regions
Jean-Sébastien Conty (alternate: Louise Burdloff), representing the Ministry for Europe and Foreign Affairs
Guy Perrin (alternate: Anne Puech), representing the Ministry of Education and Research
Full member nomination pending (alternate: Marie-Laure Van Qui), representing the Ministry of Public Action and Accounts
Benoit Bonaimé (alternate: Cyril Kao), representing the Ministry of Agriculture and Food Sovereignty
Thierry Blandinières, Managing Director of the agricultural cooperative group In Vivo
Philippe Mauguin, President, Institut national de recherche pour l'agriculture, l'alimentation et l'environnement (INRAE)
Josefa Leonel Correia Sacko, African Union Commissioner for Rural Economy and Agriculture
Mariam Sow, Executive Secretary, ENDA Pronat
Valérie Verdier, Chairman of the Board and CEO, IRD
Bertrand Walckenaer, Deputy Director General, Agence française de développement (AFD)

Elected staff representatives:
François Affholder • **Thomas Balenghien** • **Nathalie Cialdella** • **Françoise Gérard** • **François-Régis Goebel** • **Laurence Ollivier**

Secretary**: Alexandrine Rey,** Head of Legal Affairs and Compliance Office, CIRAD

Participants as of right, in an advisory capacity:
Daphné Prévost, Controller for Economy and Finance, Ministry of Education, Research and Innovation • **Anthony Farisano,** Director General in charge of Resources and Organization, CIRAD • **Pierre Defaut,** Secretary, Works Council, CIRAD • **Yves Delmas,** Auditor

SCIENCE COUNCIL

Gilles Kleitz,
Chair, Executive Director for Sustainable Development, Agence Française de Développement (AFD) (Paris, France)

William's Daré,
Vice-Chair of the Science Council researcher with UMR SENS (Montpellier, France)

Philippe Baret, Professor of Genetics, Systems Analysis and Agroecology, Catholic University of Louvain (Belgium)
Carole Caranta, Deputy Director General of Science and Innovation, INRAE (Paris, France)
Dao The Anh, Vice-President, Vietnamese Academy of Agricultural Sciences (VAAS)
Diana Fernandez, Researcher, IRD, Plant Health Institute Montpellier (PHIM), (Montpellier, France)
Anyangwe Florence Angaba-Fonteh, Professor, Dschang University, Vice-Dean for Research and Cooperation, Faculty of Agronomy and Agricultural Sciences, University of Bamenda (Cameroon)
Catia Grisa, Tutor and researcher, Federal University of Rio Grande do Sul (UFRGS) (Porto Alegre, Brazil)
Olivier Gros, University Professor of Biology of Organisms, University of the French Antilles
Tahiana Ramananantoandro, Head, Department of Forestry and Environment, École supérieure des sciences agronomiques (ESSA), University of Antananarivo (Madagascar)
Joe Tohme, Director, Crops for Nutrition and Health Programme, Alliance of Bioversity International and CIAT (Cali, Colombia)

Elected staff representatives:
Pierre Brat • **William's Daré** • **Driss Ezzine de Blas** • **Paule Moustier** • **Virginie Ravigne**

Secretaries**: Laurence Boutinot** (UPR Forêts et Sociétés) • **Alexia Prades** (DGD-RS)

INRAE-CIRAD-IFREMER-IRD "ETHICS IN COMMON" COMMITTEE

Patrick Du Jardin, President of the Committee, Professor and Head of Laboratory at the University of Liège, Gembloux Agro-Bio Tech Faculty. Member of the INRA-CIRAD-IFREMER Ethics Advisory Committee from 2009 to 2016 and Vice-Chairman of the GMO Expert Panel of the European Food Safety Authority (EFSA) from 2012 to 2015

Valérie Masson-Delmotte
Vice-President of the Committee. CEA senior scientist at Paris Saclay University's climate and environmental science laboratory. Co-Chair of IPCC Working Group I - Physical Science Basis (2015-2023). Member of the French national climate change committee (2018-2024). Member of the French national ethics consultative committee

Madeleine Akrich, Director of research at the Paris École des Mines (Sociology of Innovation Centre); engineer from the Paris École des Mines. Doctor in socio-economics of innovation
Catherine Boyen, Director of research at the CNRS; Director of the Biological Station in Roscoff (Research and Teaching Centre for Marine Biology and Ecology). Doctor in plant biology
Bernard Bret, Geographer, specializing in Latin America and more particularly Brazil. Former professor at the University of Lyon III
Denis Couvet, President of the Foundation for Research on Biodiversity; Professor at the French National Museum of Natural History; Associate Professor at the University of Lausanne and Sciences-Po Paris. Agricultural engineer, doctor in evolutionary sciences and ecology
Mark Hunyadi,Professor of social and political philosophy at the Catholic University of Louvain; associate professor at the Paris Institut des Mines-Télécom and at the EHESS; member of the Orange Ethics Committee; member of the Steering Committee and of the Steering Committee of the Forum Vies Mobiles. Doctor of Philosophy
Paula Martinho da Silva, Lawyer specializing in intellectual property and life sciences. Member of the International Bioethics Committee (UNESCO), member of the Ethics Committee of the Champalimaud Foundation and of the University Hospital of Lisbon Centre
Marie-Geneviève Pinsart, Philosopher, professor at the Free University of Brussels, research center for applied ethics; member of the IRD's Consultative Committee on Ethics for Research in Partnership (CCERP)
Pere Puigdomènech, Research professor at the Higher Council for Scientific Research (CSIC) at the Institute of Molecular Biology in Barcelona. Doctor of Biological Sciences, specialising in the molecular biology of plants)
Ricardo Serrão Santos, professeur à l'Univesité des Açores, membre permanent de l'Académie portugaise des sciences et membre émérite de l'Académie portugaise de la Marine, ancien pro-recteur à l'Université des Açores, et président de IMAR (Institut interuniversitaire de recherche marine) au Portugal, ancien député au Parlement européen et ministre de la Mer
Youba Sokona, Vice-Chairman of the Intergovernmental Panel on Climate Change (IPCC); Member of the African Academy of Sciences; Coordinator of the African Climate Policy Centre (ACPC). Professor, specialising in water, energy, environment and sustainable development

Secretariat:
CIRAD, **Estelle Jaligot** • INRAE, **Claire Lurin** • IFREMER, **Marianne Alunno-Bruscia** • IRD, **Ghislaine Thirion**

General organization (as of 31 December 2024)

GENERAL MANAGEMENT

Élisabeth Claverie de Saint Martin
Chief Executive Officer

Thierry Lefrançois, Nadine Zakhia-Rozis, Advisers to CEO
Émilie Klander, Head of Public Affairs
Marie-Laurence Pouxviel, Head of Communication
Jean-Michel Vassal, Head of Evaluation Systems
Estelle Jaligot, Head of Ethics and Research Integrity

OFFICE OF THE DIRECTOR GENERAL IN CHARGE OF RESEARCH AND STRATEGY

Director General
Jean-Paul Laclau

Deputy Director General
Thierry Fourcaud

Deputy Director General
Sélim Louafi

Assistant Director General
Sylvie Lewicki

Alain Billand, Manager, Research Impact and Marketing Service
Lisa Blangy, Deputy Manager, Research Impact and Marketing Service
Inese Rozensteine, Head, Europe Office
Tanguy Lafarge, Head of Partnerships
Anne Toulet, Head of Scientific Information and Open Science
Sasha Legrand Valdés, Head of Incentive Operations
Cathy Grevesse, Head of Quality, Social Responsibility and Research Infrastructures
Alexia Prades, Head of Tropical Value Chains
Jean-Marc Bouvet, Regional Director, Southern Africa and Madagascar
Sandrine Dury, Regional Director, Mediterranean, Middle East and Balkan countries
Patrice Grimaud, Regional Director, East Africa
Thierry Leroy, Regional Director, Central Africa
Serge Marlet, Regional Director, West Africa - Forest and Humid Savannah
Pierre Marraccini, Regional Director, Brazil and Southern Cone Countries
Jean-Marc Roda, Regional Director, Southeast Asian islands
François Roger, Regional Director, Continental Southeast Asia
Ibra Touré, Regional Director West Africa - Dry Zone
Philippe Vaast, Regional Director, Mexico, Central America and Andean countries

OFFICE OF THE DIRECTOR GENERAL IN CHARGE OF RESOURCES AND ORGANIZATION

Director General,
Regional Director, Île-de-France
Anthony Farisano

Assistant Director General
Pierre-Jean Ballard

Assistant Director General
François Laporte

Vincent Fabre-Rousseau, Regional Director, Montpellier-Occitanie
Nathalie Séguret, Deputy Regional Director, Montpellier-Occitanie
Magalie Jannoyer, Regional Director, French West Indies, French Guiana and Caribbean
Éric Jeuffrault, Regional Director, Réunion-Mayotte and Indian Ocean
Jean-Cyril Dagallier, Deputy Regional Director, Réunion-Mayotte and Indian Ocean
Isabelle Mialet-Serra, Deputy Regional Director, Réunion-Mayotte and Indian Ocean
Thierry Couloumies, Manager, Accounts and Finance
Sophie Gavelle, Deputy Manager, Accounts and Finance, in charge of Central Accounts and Finance Services
Benoît Cervello, Deputy Manager, Accounts and Finance, in charge of Decentralized Accounts and Finance Services
Aurélie Botta, Manager, Human Resources
Laurence Rouseau, Manager, Information Systems
Arthur Goubet, Technical Manager, Installations and Maintenance
Alexandrine Rey, Head, Legal Affairs and Compliance
Yann Combot, Head, Archives
Malaurie Salles, Head, Procurement Office
Fabienne Knoepflin, Head, Performance and Internal Auditing
Tiffany Gastineau, Head, Health and Safety

Scientific departments and research units

(as of 31 December 2024)

BIOLOGICAL SYSTEMS DEPARTMENT (BIOS)

Delphine Luquet, Director

Martijn ten Hoopen, Deputy Director

David Berthier-Teyssedre, Assistant Director

Guilhem Lacombe, Assistant Director

Animals, Health, Territories, Risks, Ecosystems (UMR ASTRE)

Botany and Modelling of Plant Architecture and Vegetation (UMR AMAP)

Centre for Biology and Management of Populations (UMR CBGP)

Diversity-Adaptation-Development of Plants (UMR DIADE)

Genetic Improvement and Adaptation of Mediterranean and Tropical Plants (UMR AGAP)

Host-Vector-Parasite-Environment Interactions in Neglected Tropical Diseases due to Trypanosomatids (UMR INTERTRYP)

Laboratory of Tropical and Mediterranean Symbioses (UMR LSTM)

Plant Communities and Biological Invaders in Tropical Environments (UMR PVBMT)

Plant Health Institute Montpellier (UMR PHIM)

PERFORMANCE OF TROPICAL PRODUCTION AND PROCESSING SYSTEMS DEPARTMENT (PERSYST)

Éric Justes, Director

Sylvie Mouras, Deputy Director

Agroecological Functioning and Performances of Horticultural Systems (UPR HORTSYS)

Agroecology and Sustainable Intensification of Annual Crops (UPR AIDA)

Biodiversified Agrosystems (UMR ABSys)

Biomass, Wood, Energy, Bioproducts (UPR BioWooEB)

Ecological Functioning and Sustainable Management of Banana and Pineapple Cropping Systems (UPR GECO)

Functional Ecology and Biogeochemistry of Soils and Agrosystems (UMR Eco&Sols)

Institute of Evolution Sciences of Montpellier (UMR ISEM)

Integrated Approach to Food Quality (UMR QUALISUD)

Recycling and Risk (UPR Recyclage et risque)

Water, Soil and Plant Analysis (US Analyses)

ENVIRONMENTS AND SOCIETIES DEPARTMENT (ES)

Claire Cerdan, Director

Denis Gautier, Deputy DIrector

Pascal Bonnet, Assistant Director

Sandra Vander Stuyft, Assistant Director

Actors, Resources and Territories in Development (UMR ART-Dev)

Centre for International Research on Environment and Development (UMR CIRED)

Ecology of the Forests of French Guiana (UMR ECOFOG)

Forests and Societies (UPR Forests et Societies)

Innovation and Development in Agriculture and Food (UMR Innovation)

Knowledge, Environment and Societies (UMR SENS)

Land, Environment, Remote Sensing and Spatial Information (UMR TETIS)

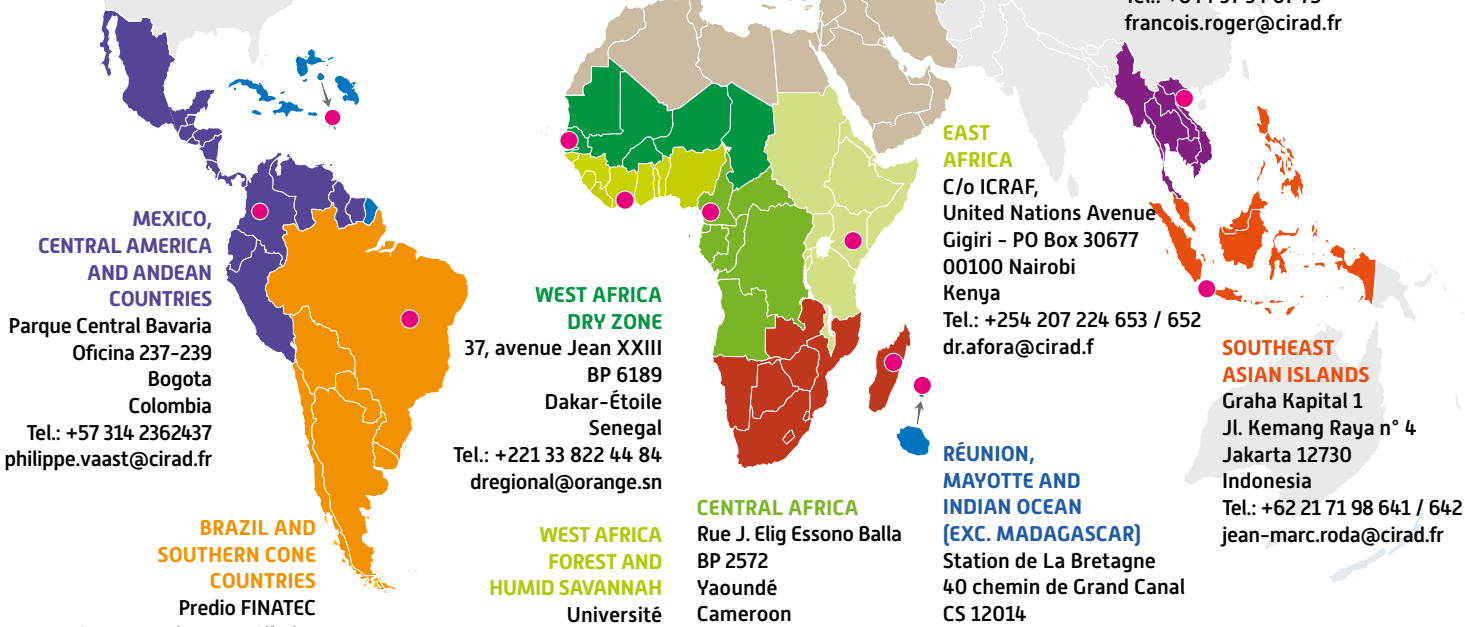
Montpellier Interdisciplinary center on Sustainable Agri-food systems (social and nutritional sciences) (UMR MOISA)

Mediterranean and Tropical LIvestock Systems (UMR SELMET)

Water Management, Actors, Territories (UMR G-EAU)

UMR: Joint research unit • UPR: Internal research unit • US: Service unit

Regional office addresses



ÎLE-DE-FRANCE
42, rue Scheffer
75116 Paris
France
Tel.: +33 1 53 70 20 21
drif@cirad.fr

MONTPELLIER-OCCITANIE
Avenue Agropolis
TA 178/04
34398 Montpellier Cedex 5
France
Tel.: +33 4 67 61 49 34
dr-mo@cirad.fr

MEDITERRANEAN, MIDDLE EAST AND BALKAN COUNTRIES
Avenue Agropolis
TA 179/04
34398 Montpellier Cedex 5
France
Tel.: +33 4 67 61 49 47
sandrine.dury@cirad.fr

FRENCH WEST INDIES, FRENCH GUIANA AND CARIBBEAN
Station de Neufchâteau
Sainte-Marie
97130 Capesterre-Belle-Eau
Guadeloupe
Tel.: +590 5 90 41 68 68
dir-reg.antilles-guyane@cirad.fr

CONTINENTAL SOUTHEAST ASIA
Cité diplomatique de Van Phuc
Bureau 102, Bâtiment 2G
298 Kim Ma
Hanoi
Vietnam
Tel.: +844 37 34 67 75
francois.roger@cirad.fr

MEXICO, CENTRAL AMERICA AND ANDEAN COUNTRIES
Parque Central Bavaria
Oficina 237-239
Bogota
Colombia
Tel.: +57 314 2362437
philippe.vaast@cirad.fr

WEST AFRICA DRY ZONE
37, avenue Jean XXIII
BP 6189
Dakar-Étoile
Senegal
Tel.: +221 33 822 44 84
dregional@orange.sn

EAST AFRICA
C/o ICRAF,
United Nations Avenue
Gigiri - PO Box 30677
00100 Nairobi
Kenya
Tel.: +254 207 224 653 / 652
dr.afora@cirad.f

SOUTHEAST ASIAN ISLANDS
Graha Kapital 1
Jl. Kemang Raya n° 4
Jakarta 12730
Indonesia
Tel.: +62 21 71 98 641 / 642
jean-marc.roda@cirad.fr

BRAZIL AND SOUTHERN CONE COUNTRIES
Predio FINATEC
Campus Univ Darcy Ribeiro
Caixa Postal 4522
CEP. 70842-970
Brasilia-DF
Brazil
Tel.: +55 61 33 66 16 01
brasil-conesul@cirad.fr

WEST AFRICA FOREST AND HUMID SAVANNAH
Université
Houphouët-Boigny
Cocody, Bâtiment IRD
01 BP 6483
Abidjan
Ivory Coast
Tel.: +225 07 22 48 18 41
ciradci@aviso.ci

CENTRAL AFRICA
Rue J. Elig Essono Balla
BP 2572
Yaoundé
Cameroon
Tel.: + 237 222 21 25 41
cirad-cm@cirad.fr

SOUTHERN AFRICA AND MADAGASCAR
Ampandrianomby
BP 853
Antananarivo 101
Madagascar
Tel.: +261 20 22 406 23
dregion@cirad.mg

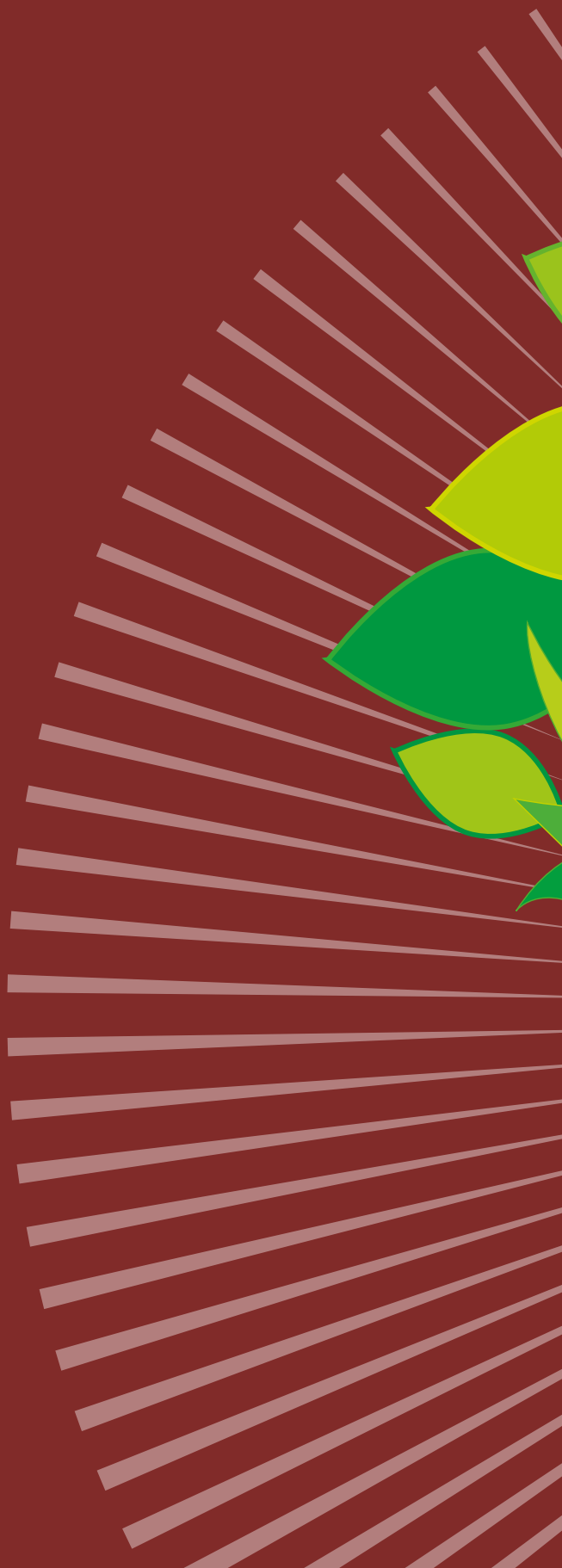
RÉUNION, MAYOTTE AND INDIAN OCEAN (EXC. MADAGASCAR)
Station de La Bretagne
40 chemin de Grand Canal
CS 12014
97743 Saint-Denis Cedex 9
La Réunion
Tel.: +262 2 62 72 78 00
dir-reg.reunion@cirad.fr

Working together for tomorrow's agriculture

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

Its works with its partners to build knowledge and solutions for resilient farming systems in a more sustainable, inclusive world. It mobilizes science, innovation and training in order to achieve the Sustainable Development Goals. Its expertise supports the entire range of stakeholders, from producers to public policymakers, to foster biodiversity protection, agroecological transitions, food system sustainability, health (of plants, animals and ecosystems), sustainable development of rural territories, and their resilience to climate change. CIRAD works in some fifty countries on every continent, thanks to the expertise of its 1750 staff members, including 1200 scientists, backed by a global network of some 200 partners. It also supports French scientific diplomacy operations.

CIRAD is a public establishment (EPIC) under the joint authority of the Ministry of Higher Education and Research and the Ministry for Europe and Foreign Affairs.



cirad
AGRICULTURAL RESEARCH FOR DEVELOPMENT

42, rue Scheffer - 75116 Paris
France

cirad.fr

UNIVERSITÉ DE MONTPELLIER

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