cirad
AGRICULTURAL RESEARCH
FOR DEVELOPMENT

2013 Annual Report

Results and prospects

< A MESSAGE FROM MICHEL EDDI, PRESIDENT OF THE CIRAD BOARD OF TRUSTEES >

THIS YEAR HAS SEEN A CHANGE AT THE HEAD OF OUR ORGANIZATION, with the retirement of Gérard Matheron – whose work I hereby recognize – and my appointment as President on 21 March. CIRAD in 2013, to which I am pleased to return after a twelve-year absence, has changed. And for the better. It is more widely recognized and appreciated on a national and international level, thanks to the quality of its scientific outputs. This positive image is primarily due to the depth of the professional commitment of all its staff members, wherever they are based, and to their ability to build synergy and generate added value, within CIRAD, and also and above all in the South, with a large number of partners.

Every year since 2011, CIRAD has focused on a cross-cutting issue for debate, action and communication. In 2013, the topic chosen was an ambitious one: how can biodiversity be a factor for agricultural development?

Our intellectual contribution, along with our partners, to the biodiversity debate, is a good example, as demonstrated by the book *"Cultivating Biodiversity to Transform Agriculture"*. Every year since 2011, CIRAD has focused on a cross-cutting issue for debate, action and communication. In 2013, the topic chosen was an ambitious one: how can biodiversity be a factor for agricultural development? The importance of that question for an organization like CIRAD is illustrated by this quote from a book* written by two of our colleagues, Robert Barbeau and Jacques Weber, who unfortunately both died too young: *"Struggling to live and being competitive in order to succeed make up one of the drivers of the living world and its success. But only one, and it is not enough; as the history of biodiversity has clearly shown, the other major driver is working together"*.

This was also the year in which the entire organization embarked upon a determined drive to bring its finances back on an even keel. This is an unavoidable necessity, a precondition for the implementation of the strategy adopted in 2013 that the contractual objectives established with the State will be setting out. Our organization has to give itself the means to implement its strategy without abandoning its ambitions.

The challenge we have to take up together is to achieve that very target, boosted by our strong culture of solidarity, and continuing to draw strength from the flexibility provided by the maintenance of our private-sector accounting status. ■

* La Vie, quelle entreprise ! Pour une révolution écologique de l'économie. Robert Barbault, Jacques Weber. Seuil, 2010

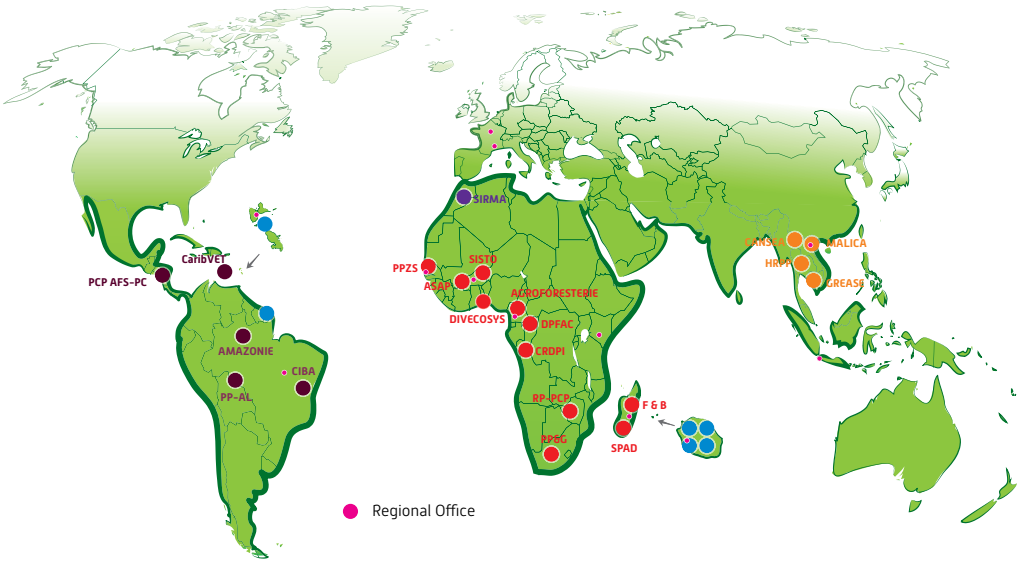
CIRAD, the French research centre working with tropical regions to address international agricultural and development issues.

CIRAD centres its research on six priority lines of research* that are shared and implemented through a global network of partners, backed up by twelve regional offices.

In the French overseas regions, CIRAD has research centres, experimental stations and advanced technical platforms at which almost 400 staff members work to support local groups and professionals in the agricultural and agrifood sectors.

* Ecologically intensive agriculture.
Biomass and non-food uses.
Sustainable food systems.
Animal and plant health.
Public action for development.
Societies, nature and territories.

< A WORLDWIDE NETWORK OF PARTNERS >



< KEY FIGURES >

A staff of 1800, including 800 researchers

Three scientific departments: Biological Systems (BIOS), Performance of Tropical Production and Processing Systems (PERSYST), and Environment and Societies (ES)

Twelve regional offices in metropolitan France, the French overseas regions and other countries

Some **thirty collective research tools** accessible to partners from developing countries and Europe

Almost **5 million euros spent on PhD courses**

More than **300 PhD students** supervised each year, 60% of them from southern countries

International Masters courses developed with the *grandes écoles* and universities

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

A budget of **197 million euros in 2014**

CIRAD, the French Agricultural Research Centre for International Development, is a public-sector industrial and commercial enterprise placed under the dual authority of the Ministries of Education and Research, and of Foreign Affairs and International Development.

CIRAD works in partnership with the whole range of southern countries to generate and transfer new knowledge so as to support agricultural development in those countries and fuel the debate on the major global issues surrounding agriculture.

It works to support both people and the planet, by tackling complex, ever-changing challenges: food security, natural resource management, inequality and poverty alleviation.

CIRAD is a targeted research organization, and bases its multi-disciplinary scientific programmes on development requirements, from field to laboratory, and from a local to a global level. The aim is to contribute to the sustainable development of rural territories and agricultural supply chains in southern countries, paying particular attention to the poorest people in those countries.

CIRAD is a founder member of Agreenium, the French national consortium for agriculture, food, animal health and the environment,

and a member of AllEnvi, the national research alliance for the environment.

agreenium

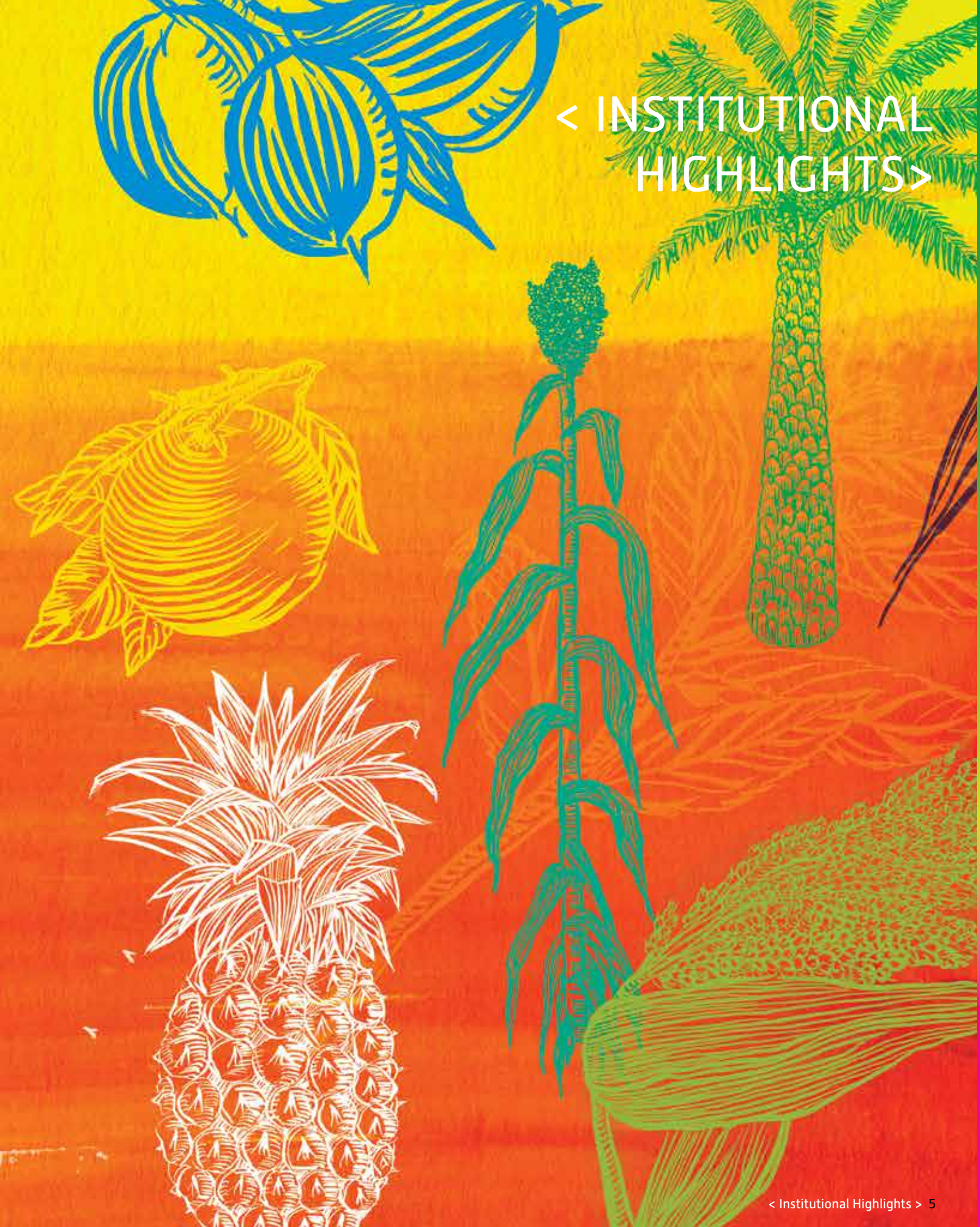
AllEnvi
Alliance nationale de recherche pour l'Environnement

Working together for tomorrow's agriculture

www.cirad.fr

eduroam

< INSTITUTIONAL HIGHLIGHTS>



Michel Eddi replaces Gérard Matheron as President of CIRAD

On 20 March 2013, the Council of Ministers appointed Michel Eddi President of the Board of Trustees of CIRAD, to replace Gérard Matheron, whose term ended on 20 February. Since 2005, Michel Eddi had been Director General in charge of research support at the l'Institut National de la Recherche Agronomique (INRA).

Michel Eddi was born on 16 December 1951, and has devoted his career to public research. He began working for the CNRS as a contract worker in 1975, and then the IPSN (Institut de Protection et de Sûreté Nucléaire), which was at the time part of the CEA, where he prepared his PhD. He stayed with the CEA as a research engineer until 1986, when he joined the French Ministry of Research and Technology, where he held different positions, including Assistant to the Scientific and Technical Director. In 1993, he joined CIRAD, initially as Deputy Director of Research then as Secretary General from 1996 to 2001. He subsequently entered the French Ministry of Higher Education and Research, where he was Deputy Director General of Research from 2001 to 2005, before joining the board of INRA. ■

Michel Eddi is a graduate of the École Nationale Supérieure de Chimie de Lille (1974) and the École Nationale Supérieure d'Electrotechnique et de Génie Physique at the Institut National Polytechnique de Grenoble (1975), and was awarded a PhD in engineering by the University of Provence (Aix-Marseille-I) in 1980. He is also a former student of the École Nationale d'Administration (Michel de Montaigne class of 1988).

A new Science Council*

"A mature, uncompromising relationship": CIRAD's general management has appreciated its three-year collaboration with its 8th Science Council (SC).

Chaired by Bertrand Hervieu, with Vice-Chair Marie-Line Iskra-Caruana, the 8th SC continued the momentum of the previous one, maintaining the goal of placing "science centre-stage", in close cooperation with general management. But it also considered the importance of partnerships in scientific production, the basis of the goal of "development through research". This process, and the drafting of the 2012-2022 Strategic Vision, dominated the work of the SC.

It has handed over to the 9th Science Council, which has a clearly international dimension (Australia, Brazil, United States, Sierra Leone, Morocco and CGIAR), chaired by Gilles Boeuf, President of the Muséum National d'Histoire Naturelle. ■

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*The Science Council is an independent body made up of 10 external members and 5 elected CIRAD members.

The 9th SC during its opening session (SC71) in September 2013. From left to right: Marco Wopereis, Régis Goebel, Jean-Louis Sarah, Bernard Chevassus-au-Louis, Thierry Candresse, Harold Roy-Macauley, Jacques Imbernon, Magalie Jannoyer, Eric Sabourin, Gilles Bœuf (Chair), Mohammed Sadiki, Laura Duarte, Louise Jackson, Didier Bazile (absent: Allison Burrell, Corinne Mencé-Caster, Olivier Le Gall)

[For further information]

2012-2022 Strategic Vision, summary (6 p.). CIRAD, 2012
Le partenariat au CIRAD, CIRAD Science Council document, June 2011 (20 p.)
http://www.cirad.fr/en/who-are-we/our-strategy

"Montpellier is home to the French research for development strike force"

Pascal Canfin, French Junior Minister for Development, visited CIRAD in Montpellier on Friday 21 June. CIRAD researchers were able to tell the Minister about the latest findings in the fields of international price volatility, large-scale land grabbing and agroecology. Mr Canfin said he was delighted that Montpellier was home to one of the "world's best 'strike forces' in terms of research for development".

Pascal Canfin with Michel Eddi, CIRAD President Managing Director, and Eric Vindimian, Regional Director at IRSTEA

CIRAD and the Agreenium consortium

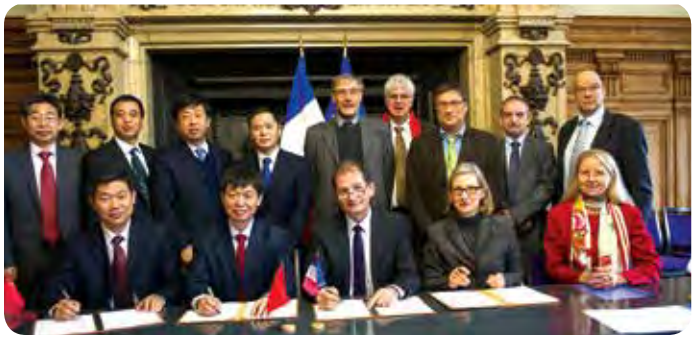
The goal of Agreenium, of which CIRAD is a founding member, is to build a consolidated French agricultural and veterinary research and higher education capacity and to promote that capacity on an international level. More specifically, CIRAD is helping to develop the relationships between Agreenium and the countries of the South, particularly through its regional directorates.

- **CIRAD's research units** have been integrated into the bilingual database (English-French) of the units and research teams of Agreenium members (around 260 units and more than 800 teams). After the "Masters courses" portal, this information increases the visibility of research teams.

- **Within the framework of the European AgreenSkills+ programme,** following on from AgreenSkills, which funds merit scholarships for the period 2014-2019, several teams at CIRAD are benefiting from the skills of European researchers.

- **Agreenium and the World Bank** agreed on a common "roadmap" for Africa focusing on three areas: a global strategy for the Sahel; agricultural, veterinary and environmental higher education; and the African part of the "Climate-Smart Agriculture" initiative. Operations already launched by CIRAD are reinforced by this roadmap.

- **Agreements have been signed with the Chinese Academy of Sciences (CAS) and the Chinese Academy of Agricultural Sciences (CAAS)** to foster the hosting of merit scholarship PhD students in CIRAD's research teams. ■



Signature of the MoU between CAAS and Agreenium © Cheick Saidou, Min. Agri. Fr.

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www.agreenium.org

Attractive scientific platforms

In the French overseas regions and in mainland France, there are almost 30 scientific and technical platforms in which CIRAD and its national partners are investing and pooling their efforts, providing the international scientific community with access to original, high-level resources. These attractive platforms complement CIRAD's 21 research and training platforms in partnership abroad. In 2013, two projects received substantial support from Europe, and two technical platforms were certified by AFNOR.

In Montpellier

3.5 million euros for the ARCAD platform

Sorghum trials in Cameroon © CIRAD

In 2013, the EU granted 3.5 million euros of funds to the ARCAD (Agropolis Resource Center for Crop Conservation, Adaptation and Diversity) project, led by CIRAD, INRA, IRD, Montpellier SupAgro and Agropolis Fondation. This support will be used to develop the technology platforms required to analyse and conserve plant biological resources, including the creation of a DNA bank. It will also contribute to the creation of 12 jobs between now and 2015.

Around 100 researchers and teaching and technical staff members are involved in the ARCAD project. The Languedoc-Roussillon Regional Council is providing 5 million euros for the construction of the ARCAD building, which is due for completion in 2016 and will cover some 2 500 m^2. ■

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http://www.arcad-project.org/

1.25 millions euros for QESAMED

Alongside 21 French-speaking Mediterranean partners, CIRAD and the Conservatoire National des Arts et Métiers (CNAM) won the European QESAMED proposal. Jointly led by the two organizations, this project (2014-2016) is aimed at capacity building in higher education and agricultural research establishments in Morocco, Algeria, Tunisia and Lebanon. The initiative was selected within the framework of the highly competitive call for proposals under the European Tempus IV programme. It will help to improve agricultural training courses by integrating the quality approach and the metrological process, thereby enhancing good research practices. **One of the key points of the project is the application of skills by university lecturers, PhD students and undergraduate students on pilot research platforms,** through which they will benefit from the experience acquired by CIRAD over more than 10 years. ■

QESAMED launch meeting in Paris © Luc Martin/CIRAD

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http://www.eliosud.fr/ CIRAD is contributing to the Eliosud portail, launched on line in 2013, which presents the research infratsructures supported by INRA, CIRAD and Montpellier SupAgro in the Languedoc-Roussillon region and French overseas departments.

In Montpellier

Plant genomics: two technical platforms certified under ISO9001

The CIRAD bioinformatics and genotyping platforms, hosted in Montpellier by the AGAP Joint Research Unit, now have ISO9001:2008 certification from AFNOR. The certification was awarded on 12 April, and concerns the platforms' activities regarding provision of genotyping and bioinformatics equipment and software for agronomy.

The genotyping platform in Montpellier © Eliosud

The **genotyping platform** specialises in the use of high-throughput molecular biology technologies for the genetic analysis of plant biodiversity and to support the use of genetic resources in crop improvement programmes. **The structure in question is part of the regional genotyping technology platform,** which is itself part of the MGX-Montpellier GenomiX platform. ■

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The **bioinformatics platform supports the storage and bioinformatic analysis of genetic and genomic data on tropical and Mediterranean plants.** It is part of the South Green Bioinformatics platform and has already enabled the analysis of large-scale projects such as the annotation of the full genomes of cocoa and banana. ■

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In the Caribbean

3.5 million euros for Epigenesis

Led by CIRAD, the European RegPOT Epigenesis project was launched in September in Guadeloupe for a duration of three years. Its aim is to consolidate regional research potential and to make the CMAEE research unit in Guadeloupe a centre of excellence for emerging and vector-borne diseases. This consolidation involves the recruitment of six researchers, the acquisition of state-of-the-art equipment, and increased interaction between all partners involved (European, Guadeloupean and Caribbean). By enhancing capacities for research and knowledge sharing within a One Health framework (animal and human), Epigenesis will help to improve the prediction, monitoring and control of these diseases. They include: tick-borne diseases of ruminants such as heartwater, babesiosis and anaplasmosis; West Nile fever, a mosquito-borne disease; avian influenza; and Newcastle disease.

Epigenesis is the only RegPOT programme project coordinated by CIRAD. ■

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Sampling ticks from a goat © P. Fournier/CIRAD

For the Science Festival on 9 October, which in Montpellier was entitled "From the infinitely large to the infinitely small", CIRAD opened the doors to three of its platforms:

> the agrifood technology platform, where the public could watch fruit crisps being made, fish and meat being smoked, and fruit juice being filtered;

> the bioenergy platform, presenting the biofuels of the future;

> and the new Pl@ntNet platform smartphone application, to identify in situ the plants all around us.

Fish smoking © CIRAD

A pivotal year for the French overseas departments and territories

CIRAD's regional offices in the French overseas departments and territories have been mobilized under the 2014-2020 European operational programmes, which will translate into renewed contracts with each territorial authority. This priority focal area will also be accompanied by the renewal of the technical innovation and agricultural transfer networks (RITA), a process conducted with interest by the French Ministry of Agriculture for the last two years. CIRAD has handled the delegated management of RITA, under the authority of this Ministry, and is a key actor in these networks at the scientific level. Several key events marked 2013.

Caribbean, French Guiana

The **European Cooperation Days,** which were open to the general public, were organized by the Interreg IV Caraïbes programme on 25 and 26 September in Guadeloupe. CIRAD presented four major projects: CaribVET, the Caribbean Animal Health Network; Cabaré, the Caribbean Network for the Prevention and Sustainable Control of Emerging Banana Diseases; DEVAG, the Caribbean Network for the Development of Agroecological Horticultural Systems; and the Caribbean Sustainable Banana Plan, in partnership with the Union des Groupements de Producteurs de Bananes de Guadeloupe et Martinique (UGPBAN) and the Institut Technique Tropical (IT2).

The special morning of discussions organized on 25 September by the Regional Council, as part of the **Year of the Dominican Republic in Guadeloupe**, showcased two of these projects that involve the Dominican Republic: CaribVET and the Caribbean Sustainable Banana Plan.

The **French Guiana regional agricultural show** was attended by more than 6000 visitors on 19 and 20 October at the Matiti Agricultural College. This event was organized by the Young Farmers and the Association pour la Promotion de l'Agriculture et des Produits Agricoles de Guyane (APAPAG). CIRAD presented several of its activities in French Guiana: the experimentation network for the Arabusta coffee plant, the result of the hybridization of Arabica and Canephora (Robusta); the promotion of elite varieties of wild French Guianan cocoa trees; and the sustainable management and promotion of rosewood.

The **first Martinique agricultural show** was held from 15 to 17 November at the André Aliker de Dillon Stadium (Fort-de-France). Organized by the Martinique Regional Council, this free event attracted more than 30 000 visitors. In the "services" area, researchers from CIRAD presented the work conducted within the Caribbean agro-environmental campus (CAEC), in partnership with IRD, CNRS and INRA, and within the technical innovation and agricultural transfer networks (RITA) in Martinique, in cooperation with INRA, IT2, IKARE, FREDON and the Chamber of Agriculture. ■

On the CIRAD stand in Guadeloupe, from l. to r.: Charles Meynard, Claire Amar (CIRAD), Victor Antonio Pena (Ado banano), Dominique Polti (CIRAD) and Sébastien Zanoletti (UGPBAN, IT2) © S. Della Mussia/CIRAD

Réunion, Mayotte

The **issue of food security** brought together some 200 public and private sector representatives from the Islands of the Indian Ocean in Mahajunga on 25 and 26 March. Organized by the Indian Ocean Commission (IOC), the aim of this roundtable was to outline a regional cooperation project on this subject. CIRAD took this opportunity to reaffirm its commitment to this priority area for agricultural research.

The **management of disease surveillance in tropical island territories** was the subject of a forum from 11 to 13 June in Réunion. Some 300 experts from the Caribbean, the Pacific and the Indian Ocean shared their experience on this public health issue. Among the international recommendations, the "One Health" approach is aimed at consolidating the human-animal-environment interface. The Islands of the Indian Ocean are committed to this approach through the merging of two regional cooperation projects, one focusing on human health (the SEGA network) and the other on animal health (the AnimalRisk-OI network).

During the 19th Conference of Presidents of the OMRs in Réunion, on 17 October, Johannes Hahn, the European Commissioner for Regional Policy, visited the Plant Protection Platform (3P), at the invitation of the President of the Réunion region, accompanied by all of the OMR Presidents. What if the EU outermost regions (OMRs) were viewed according to their advantages rather than their difficulties, especially in the field of research and innovation? This is what is hoped for in Réunion, which benefits, with CIRAD, from the most extensive research system in the Indian Ocean. Réunion undertook to provide a plan of action to the European Commission for the period 2014-2020.

The Agrofert'îles meetings, which were held for the first time in Réunion from 18 to 22 November, proved highly successful (almost 150 participants). Organised by the RITA Réunion, e-PRPV and QualiREG networks, the aim of these meetings was to create synergies between research, training and business. Delegations from Madagascar, Mauritius, the Comoros and Seychelles thus played an active part in the conferences, debates and workshops organised throughout the week in the different venues (CIRAD, Armeflhor, IUT de Saint-Pierre, Lycée Agricole de Saint-Paul).

The RITA Mayotte scientific and technical council took place on 16 October at the Lycée Agricole de Coconi. The technicians from all the different structures (animal and plant networks) met to take stock of the two years of projects that enabled the launch of RITA, and to discuss future projects from 1 January 2014. ■

Gilles Mandret (inset) and from left to right: Didier Robert, President of the Réunion Regional Council; Johannes Hahn, European Commissioner and Daniel Zaïdani, President of the Mayotte Regional Council

Supporting open access to knowledge

The HAL open access national archive

For several years, CIRAD has been involved in the global movement for open access to knowledge. On 2 April at the Académie des Sciences, the organization reaffirmed its support for the principle of open access to knowledge by signing the agreement for the development of the HAL open access national archive, along with 25 other French establishments. It confirmed its commitment to promoting its publications through the HAL archive. ■

http://hal.cirad.fr/

The signatories of the new HAL agreement, at the Académie de Sciences in Paris on 2 April 2013
© M.E.S.R./XR Pictures

Digitizing CIRAD's heritage library

As part of its colonial history digitizing programme, the Bibliothèque Nationale de France (BnF) signed a partnership with CIRAD for the digitization of heritage collections of journals. The first results have been available for several months on Gallica: *De l'agriculture coloniale à l'agronomie tropicale : les collections de la bibliothèque historique du CIRAD*. This partnership is expected to continue with the digitization of other collections. ■

http://blog.bnf.fr/gallica/index.php/2013/10/03/de-lagriculture-coloniale-a-lagronomie-tropicale-les-collections-de-la-bibliotheque-historique-du-cirad-2/

E-learning in French for the IMARK platform

Writing and publishing a scientific or technical document is the first online module in French within the framework of the distance learning initiative launched by FAO and its partners: Information Management Resource Kit (IMARK). This module, developed by CIRAD, is aimed at French speaking scientists. More specifically, it concerns researchers in the countries of the South and scientists involved in agricultural research and rural development. The module presents the different stages involved in publishing a scientific or technical document, from drafting to distribution. ■

http://www.imarkgroup.org/index_en.asp

Support for the XIVth IAALD World Congress

CIRAD took part as a sponsor, exhibitor and speaker in the 14th World Congress of the International Association of Agricultural Information Specialists (IAALD), which was held from 22 to 24 July at Cornell University, Ithaca, United States. The mission of IAALD is to use information to contribute to a more productive and sustainable use of the world's land, water, and natural resources. CIRAD presented a paper entitled *"French agricultural research institute paves the way to open access: feedback from CIRAD"*. ■

http://www.iaald.org/iaald2013

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Better understanding the research and training platforms in partnership

Twenty-one research and training platforms in partnership (PPs) were established in 2012, enabling targeted research to be carried out in the field. But what do they actually represent? The information collected in 2013 helps to better define the profile and rationale of these PPs.

Men and women at CIRAD. The PPs mobilize 132 of the 192 senior scientists posted abroad. The average age is 45 years. Of the 21 coordinators, 18 are men and 15 are over 45 years of age. Of the 70 researchers aged over 45, only one is a woman. However, the three female coordinators are all under 45 and women are in the majority among the 20 youngest researchers. It is therefore clearly the new generations at CIRAD who are training and working in the field.

Partners. In total, 136 institutions with complementary skills have established contractual relationships with CIRAD within the framework of these platforms. These include national, regional (CATIE, CIRDES) and international (CGIAR) research organizations, sector support organizations, higher education establishments and universities, in the fields of agronomy, economics and administration.

Associates. The platforms are involved in networks for the dissemination of knowledge and innovations: State services, producer organizations, NGOs, etc. They also act as an interface with the local branches of European partners and international networks.

Beneficiaries. The beneficiaries of their research are small producers, but also regional management and development support operators, policy-makers and local authorities, and all those who integrate international mechanisms into development policies. Other beneficiaries are students and scientists, who can use the most recent knowledge to increase their skills, and who can help to share the findings of research in their publications.

Technical expertise and skills. The PPs are knowledge networks that are of interest to donors. They implement numerous research and development projects, build experimentation networks, observatories, and atlases, and produce educational films, events, workshops and skills training in the local languages. ■

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Students in Zimbabwe
© A. Caron/CIRAD

Productive partnerships with CGIAR

CIRAD is the leading French organization in terms of co-publications with CGIAR, and is also closely involved in several CGIAR Research Programmes (CRPs). The establishment of the headquarters of the consortium in Montpellier has facilitated these partnerships.

The leading French partner in terms of co-publication

A bibliometric study was conducted by Agreenium and INRA concerning co-publications between CGIAR and research organizations from 2003 to 2012. With 254 co-publications, CIRAD is the CGIAR's fifth biggest partner, behind Wageningen University (WUR), the Chinese Academy of Agricultural Science (CAAS), the United States Department of Agriculture (USDA) and Cornell University (US). However, CIRAD is the CGIAR's leading French partner in terms of co-publications, ahead of IRD (8th) and INRA (14th).

If we consider publications involving at least one member of Agreenium, the figure is 413, which puts the French consortium in first place. Moreover, 56% of CGIAR co-publications with France are in journals whose reputation is classed as exceptional or excellent as per the JCR index, compared to 41% for CGIAR publications as a whole. ■

Specific projects

On 4 March at Agropolis International, Montpellier, partnership agreements were signed between the French research establishments and the CGIAR consortium. Further to these agreements, on 19 June, under the aegis of the Commission pour la Recherche Agricole Française (CRAI), the heads of the CRPs and of French agricultural research institutions (CIRAD, IRD, INRA, Agreenium) met in Montpellier to discuss the means of stepping up their cooperation, which is already highly significant and diverse, especially in CIRAD's case.

In addition to participation in the CRPs, a cross-cutting initiative discussed on 19 June was launched. This is a joint programme for post-doctoral students. Three research projects presented by joint CIRAD-CRP teams (RTB, Dryland Cereals, CCAFS) obtained funding for two post-doctoral positions, one from CIRAD and the other from the CRP concerned.

This initiative should be renewed in 2014 and could be joined by Agropolis Fondation. ■

Representatives of the signatory organizations (from left to right): Frank Rijsberman (CGIAR); Anne-Lucie Wack (SupAgro); Carlos Perez del Castillo, President of the CGIAR Consortium; Michel Laurent (IRD); Marion Guillou (INRA); Jacques Pagès (CIRAD) and Olivier Le Gall (INRA) © C. Salson/Agropolis International

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The CRPs in which CIRAD is involved

The CRPs are medium-term targeted research programmes through which the CGIAR implements its strategy. Each CRP is led by one CGIAR centre, but generally involves several centres and also associates external partners (research centres, universities, development agencies, etc.) to varying degrees.

CIRAD has contributed to the CRPs since their development began in 2010, based on three principles: co-construction, co-investment and co-governance. It is now closely involved in several CRPs, including: Rice (GRiSP), Forests and Agroforestry (F&A), Roots, Tubers and Bananas (RTB), Dryland Cereals (DC), and Dryland Systems (DS). But it also contributes to Climate Change, Agriculture and Food Security (CCAFS), Livestock & Fish and Humidtropics.

IntensAfrica, a joint initiative between Europe and Africa

Sustainable intensification, agro-ecology, the new green revolution, etc. There is no universal model for the modernization of African agriculture, given the range of different contexts, challenges and expectations. But how can an economic, environmental, political and social comparison be made of the different options for intensification, on an informative scientific basis for producers and policy-makers?

On these grounds, acknowledging that this requirement is just as important for the future of European agriculture, CIRAD and the University of Wageningen launched the idea of a partnership between Europe and Africa: "IntensAfrica". Developed through discussions with 13 European partners, the Forum for Agricultural Research in Africa (FARA) and the New Partnership for Africa's Development (NEPAD), this long-term partnership for research and innovation will mobilize national research systems and could be integrated into the programmes implemented as part of the Science Agenda for Agriculture in Africa (S3A).

IntensAfrica will be developed in several stages. It will begin with a proposal for coordination action, submitted to the Horizon 2020 call for proposals for 2014. It will then evolve towards a more advanced integration mechanism (REAnet, JPI or Article 185), which could be launched in 2017. ■

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A "connected" farmer in Cameroon © E. Torquebiau/CIRAD

The IntensAfrica agenda

September 2012 > First consultation in Wageningen, with 13 institutions from 12 European countries.

March 2013 > Drafting of a concept note in Montpellier, during a Europe-Africa meeting in which FARA and NEPAD took part.

July > Presentation of the concept note in Accra (Ghana) during the 6th FARA Africa Agriculture Science Week (800 people).

April, August > Submission to the European Commission.

November > Presentation in Brussels during the EU-Africa High Level Policy Dialogue on Science, Technology and Innovation (STI).

February 2014 > Workshop involving 30 representatives from European and African institutions to prepare a proposal to submit to the Horizon 2020 programme.

Europe: From FP7... to Horizon 2020

In total, CIRAD participated in 58 projects financed under FP7: this began in 2007 and the last calls were published in 2013.

Invited to Montpellier by CIRAD and Agropolis International, John Claxton (Directorate General for Research and Innovation) presented the new European Commission strategy for international cooperation as part of a conference on 14 March. A meeting took place between Mr Claxton and the different members of Agropolis International.

This strategy will play a key role in cooperation opportunities for third countries in the new Horizon 2020 Framework Programme for Research and Innovation.

France Year in Vietnam: a 20-year partnership

For 20 years now, CIRAD researchers have been working in Vietnam on numerous projects: supply chain socioeconomics; livestock and crop production; animal health and epidemiology; food sanitary quality; agro-ecology in upland regions; biodiversity; natural resource management, particularly water and soils; and information and communication sciences.

To mark this anniversary, and as part of France Year in Vietnam, **CIRAD produced a photographic exhibition comprising 55 posters, and organized four conferences** for the Vietnamese general public, from 15 to 18 October. The exhibition, at the Institut Français in Hanoi, ran until mid-November 2013, and is being shown in France in 2014 as part of Vietnam Year in France.

And to continue the good relations, a framework agreement extending CIRAD's partnership with Vietnam by five years (2014-2018) was signed by the Deputy Minister of Agriculture and Rural Development and by Michel Eddi, CIRAD President Managing Director, during his trip to Hanoi in October. ■

Thailand: three key agreements

Rubber growing and fertilization with Yara

During a trip to Thailand in October, Michel Eddi, CIRAD President Managing Director, signed a research agreement on rubber growing with the Norwegian international firm Yara. An initial convention will particularly focus on studying current practices among smallholders as regards fertilization. The agreement constitutes one of the first public-private partnership agreements for CIRAD in Thailand.

Biomass energy platform in partnership

An agreement was signed with King Mongkut's University of Technology Thonburi (KMUTT), for the construction of a platform in partnership on biomass energy. This is part of the consolidated partnership with the Centre National de la Recherche Scientifique (CNRS) and Kasetsart University (KU). It should eventually be classed as an International Research Network by the Thailand Research Fund (TRF) and constitute the "Asia" focal point of a future intercontinental network on biomass energy, due to associate the Institut International d'Ingénierie sur l'Eau et l'Environnement (2iE) in Burkina Faso and the Federal University of Pará in Brazil.

75 merit scholarships funded by the Thailand Research Fund (TRF)

At the Government House of Thailand in Bangkok, five agreements were signed between France and Thailand on 5 February, in the presence of the Prime Ministers of both countries, Jean-Marc Ayrault for France and Yingluck Shinawatra for Thailand, along with a number of French and Thai dignitaries.

CIRAD, represented by Jacques Pagès, and the Thailand Research Fund (TRF) signed a general funding agreement for 75 PhD grants for students from Thailand, but also from other Southeast Asian countries, within the framework of international research networks (IRNs). Through this agreement, the TRF officially recognizes three of CIRAD's platforms in partnership as centres of scientific excellence for the supervision and support of these PhDs: the Regional Network for the Management of Emerging Epidemic Risks in Southeast Asia (GREASE); the Hevea Research Platform in Partnership (HRPP); and the network currently under construction with the National Science and Technology Development Agency (NSTDA) and the CNRS on biomass energy. ■

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Costa Rica: 7th Wallace Conference on climate-smart territories

From 30 September to 4 October, the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) and its partners organized a conference on "Climate-smart territories in the tropics: production, mitigation and adaptation for improved well-being" in Turriallba (Costa Rica).

Bringing together scientists, experts, academics, producers and decision-makers, the aim of this conference was to analyse how rural territories in the tropics should prepare for a future with less water, new agro-ecological conditions and changes in natural ecosystems, while addressing the need to adapt to the challenges of climate change. Eight representatives of indigenous groups from America organized 'parleys' with the public on their traditional knowledge. The group sessions focused on four main questions: what are the advantages of a climate-smart territory? Who has the legitimacy to determine whether an area could be classified as a climate-smart territory? What essential elements, conditions and processes determine whether a territory can be classified as climate-smart (relationships with neighbours, governance, biophysical aspects, economy, adaptation and mitigation)? And what types of action would be most effective, while also promoting fair, legitimate local development?

CIRAD actively participated in the event with presentations and numerous posters: Nicole Sibelet, member of the Science Council and keynote speaker, conferences with Patrick Caron, Bruno Locatelli and Jacques Avelino. ■

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South African landscape
© E. Torquebiau/CIRAD

2013, Year of Biodiversity for CIRAD

Every year since 2011, CIRAD has focused on a cross-cutting subject for research, communication and action.

In 2013, the organization approached its priorities and its position from the viewpoint of biodiversity: how can biodiversity be a factor of development?

Contributing to development

Under what conditions can the conservation, restoration or exploitation of biodiversity contribute to development? This key question underlies four issues: production; ecosystem resilience and the adaptation of rural societies; reducing poverty and inequalities (what compensation?); and food security and nutrition. It has enabled CIRAD to enhance the content of its priority focal areas and to communicate more effectively. ■

http://www.cirad.fr/en/research-operations/research-topics/biodiversity-and-development/research-issues

Assessing biodiversity

IPBES (Science and Policy for People and Nature), the equivalent of the IPCC (Intergovernmental Panel on Climate Change) for biodiversity, held its first meeting in January in Bonn, Germany. CIRAD (Jacques Weber, then Didier Babin) has been actively involved in the lengthy process (eight years) leading to this creation, through IMoSEB (International Mechanism of Scientific Expertise on Biodiversity) promoted by France and entrusted to the Institut Français de la Biodiversité (IFB, now FRB). Gilles Boeuf, Chair of the CIRAD Science Council, is a member of the IPBES bureau. ■

www.ipbes.net/

Regulating access to genetic resources

Access to genetic resources and their management raises some complex questions: conservation, use, exchange of plant genetic resources, policies on access and sharing of benefits arising from their use, agricultural biodiversity, and food security. This is why CIRAD is developing ethics, guidelines and methods to guarantee the management and promotion of these resources in compliance with international conventions. The members of the Comité de Ressources Biologiques (COREBIO) are contributing to discussions on the implementation of the Nagoya Protocol in European and national legislation. They are also present in FAO meetings concerning the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). ■

Promoting collections

In Montpellier and the French overseas departments and territories, the CIRAD, IRD and INRA Biological Resource Centres (BRCs), which have been part of a network since 2010, host some unique collections: VATEL BRC (Réunion); Coffee BRC (Réunion and Montpellier); Tropical BRC (Montpellier); Perennial Crop BRC (French Guiana); and Tropical Plant BRC (Guadeloupe and Martinique). These collections form the basis of breeding, research and promotion programmes carried out by different institutes, especially within the framework of projects such as VALEXBIOTROP (promotion and use of biodiversity) and CARAMBA (Caribbean). ■

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Cultivating Biodiversity to Transform Agriculture

How can cultivated plant biodiversity contribute to the transformation and the "ecologization" of agriculture in southern countries? This collective work by CIRAD presents the substantial scientific progress made during extensive field work in southern countries, in all the areas affecting agriculture (agronomy, plant breeding, crop protection, cropping systems, innovation and ownership of the living world, etc) in order to intensify the ecological processes in cultivated plots and on the scale of rural landscapes. This book is the first in a series of annual collective works on key research topics at CIRAD.

Cultivating Biodiversity
to Transform Agriculture,
E. Hainzelin Ed.,
Edition Springer, 2014

Highlights of the year

January • Bonn, Germany > First IPBES plenary meeting.

February-March • Paris, France > International Agricultural Show: a stand, events and numerous conferences on the subject of "Cultivating biodiversity".

March • Libreville, Gabon > Regional workshop on "Scenarios for African biodiversity", organized by the FRB in preparation for the launch of IPBES.

April • Rome, Italy > COREBIO took part in the 14th session of the FAO Commission on Genetic Resources for Food and Agriculture.

June • Rome, Italy > France-Algeria workshop on "Agro-ecology, the way forward" at the FAO. E. Hainzelin presented, "Agro-ecology: new approaches and changes in agriculture" at the request of the French Ministry of Agriculture, Agrifoods, and Forestry.

September • Muscat, Oman > 5th Session of the Governing Body of the ITPGRFA. COREBIO organized a parallel workshop.

November • Ilheus-Bahia, Brazil > Workshop organized by the Consortium International en Biologie Avancée (CIBA - one of CIRAD's platforms in partnership), on biotic and abiotic stress tolerance in plants.

November • Montpellier, France > The ARCAD project (Agropolis Resource Center for Crop Conservation, Adaptation and Diversity) was granted 3.5 million euros by the European Regional Development Fund (ERDF).

December • Montpellier, France > A scientific seminar brought together around 150 experts in agroecological engineering and ecological engineering from INRA, CIRAD, CNRS and IRSTEA.

Communicating

The theme "Cultivating biodiversity" ran through CIRAD's communications in 2013. It was presented on the CIRAD stand at the Paris International Agricultural Show in February and during the biodiversity festival in May in Montpellier. In the Comoros, in November, the exhibition entitled "La Nature comme modèle" was presented by the Comoros Ministry of the Environment as part of the regional cooperation project e-PRPV. In Réunion, the science festival was held from 24 to 26 October at the CIRAD Arborécole in Saint Denis. In Guadeloupe in November, it presented the range of different banana trees; and in Martinique, the benefits of cover crops for agroecology. In Kourou, French Guiana, high school students discovered the diversity of cocoa plants in the CIRAD collection and the wealth of different species in the Amazon forest. These events were the opportunity for researchers to meet the public during different conferences. ■

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Setting up joint projects

As a member of the Fondation pour la Recherche sur la Biodiversité (FRB), CIRAD contributed to the construction of the Centre de Synthèse et d'Analyse sur la Biodiversité (CESAB), which mobilizes French expertise and hosts groups of researchers for working sessions aimed at making better use of existing data and information. Many of these projects concern African countries.

In Africa and Central America, the SAFSE is an incentive project on tropical agroforestry systems that associates CIRAD and IRD within the framework of their respective research platforms in partnership. Where agrobiodiversity is concerned, both organizations and their partners are working together in the Sahel region on sorghum, millet and fonio. ■

Agro-ecology: crucial synergies between agronomists and ecologists

In order to compare the experiences of agronomists and ecologists, INRA, CIRAD, the CNRS Institut Ecologie et Environnement (INEE) and IRSTEA organized a seminar entitled "Ecological and agro-ecological engineering through and for the living world" on 19 December in Montpellier.

Agro-ecological engineering, which focuses on cultivated systems, associates agronomists and, increasingly, agro-ecologists. Ecological engineering, which is led by ecologists, concerns natural environments and especially issues such as their restoration and preservation. The convergences between these two scientific subjects revolve around common conceptual approaches, a shared and growing interest in the many different ecosystem services at the territorial level, an increase in social demand for these services, and the emergence of public policies: national strategy for biodiversity, blue-green infrastructure, market-based offsets, and action plans by the Ministries of Agriculture and Ecology.

During this seminar, the three CIRAD scientific departments presented CIRAD's approach to ecological intensification and ecological engineering. The very wide range of contexts in which CIRAD operates was illustrated: family farming, agroforestry systems, and intensive monoculture in transition towards more sustainable systems, etc.

Developing systems based on agro-ecological approaches radically modifies farmers' practices, and the observation and integration of local information and references play a major role in this. This approach could mark the end of turnkey technical "models" and significant changes in support activities. More fundamentally, it is essential to rethink the interactions between research, farmers and public policy within innovation systems.

A summary of this meeting is being produced and should result in the co-publication by the four organizing institutions of several articles in scientific journals. ■

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Intercropping banana with *Stylosanthes guianensis* in the Caribbean © S. Lakhia/CIRAD

Plot of coffee trees in the shade of *Erythrina poeppigiana* © B. Rapidel/CIRAD

2013, International Year of Quinoa

© D. Bazile/CIRAD

Didier Bazile represented France on the International Year of Quinoa 2013 International Coordination Committee (IYQ-ICC), whose Secretariat is established in the FAO Regional Office for Latin America and the Caribbean. He is also one of the five members of the scientific committee. As such, he is coordinating the book "Estado del arte de la quinua en el mundo en 2013", which associates 160 authors and will be published in 2014. He contributed as a keynote speaker to different international conferences: Agadir (Morocco); Ibarra (Ecuador); Washington State University (United States); and Milan (Italy).

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Estado del arte de la quinua en el mundo en 2013. Libro de resúmenes. Bazile D. (ed.), Bertero H.D. (ed.), Nieto C. (ed.). Santiago de Chile: FAO/CIRAD, 2013, 67 p.

CIRAD's priority lines of research are changing

CIRAD's priority lines of research were intended to steer its research units' scientific activities within the framework of its 2008-2012 strategy plan, and not to reflect the full scope of its operations. While overall, they fulfilled that role, it transpired that in view of scientific developments, adjustments were required to ensure greater integration of our research and more coherent outputs. In particular, it was essential to give our teams the means to break down a certain number of persistent walls between agriculture, the environment and development. In 2012, CIRAD management deemed it necessary to launch a review of our priority lines of research. This took a year and a half and involved everyone in the establishment. The new lines were validated in 2013.

< Ecologically Intensive Agriculture >

Inventing sustainable farming systems that make optimum use of agro-ecosystems is the objective that concentrates the most energy at CIRAD. Above and beyond issues specific to plant health, which are now covered by the Animal and Plant Health line, the target is ecological intensification, in a context in which agro-ecology is becoming a major political goal in the drive to address the issues surrounding adaptation to global change.

© B. Locatelli/CIRAD

In five years, the way in which agronomy has changed as regards ecology and biodiversity issues has given rise to new developments in terms of research. This is also the case for genetics and genomics. The interest being shown in functional biodiversity is one of the elements of that change.

< Biomass and Non-Food Uses >

This line was originally geared towards biofuels, and has now been expanded to cover biomass in the broadest sense of the term, in other words the non-food aspects of agricultural production, including co-products and waste. It fits in with the move towards an integrated vision of the various aspects of non-food products – use-processing-production-resources – and also looks at the ins and outs of competition between various biomass uses.

© J.-P. Morin/CIRAD

< Sustainable Food Systems >

Ensuring the food security of southern societies is the broad aim of our food-oriented activities. Security used to be looked at in terms of food quantity and safety. These elements are still just as important, but are now addressed on the same level as the other aspects of food security: availability, accessibility, consistency and quality. This means looking more at the dynamics of food systems, including the players involved and the market governance methods used to ensure sustainable food supplies.

© N. Cialdella/CIRAD

< Animal and Plant Health >

Understanding, anticipating and managing the risks linked to animal and plant pests and diseases... this major shift means looking in a more rational way at the issues surrounding both animal and plant health and how they relate to agricultural and environmental issues. Systemic approaches to health such as One Health or Ecohealth hinge on better integration between sectors (health, agriculture, environment, rural development) and between disciplines, also including the social sciences, notably when it comes to governance and sanitary surveillance.

© A. Perrotton/CIRAD

< Public Action for Development >

Initially, this line confirmed public policy as a research topic. It has now been strengthened and broadened out, ranging from policies whose direct aim is to address inequality and poverty to agricultural, environmental, land tenure and innovation policies, in the hope of tackling intersectorial issues more effectively. The idea of public action, which was already included, has also been reinforced, to take greater account of the range of players involved in public regulation: not just policy-makers, but also farmers, private firms, NGOs and other groups in the public arena. CIRAD is fully qualified to tackle agricultural, environmental and land tenure questions from this angle, particularly as regards their effects on sustainable development.

© G. Trébuil/CIRAD

< Societies, Nature and Territories >

The relations between nature, societies and territory management used to be marked by "conflict" between agriculture and the environment, with a concept of environmental management that was very detached from, if not even in competition with, agricultural issues. This has now been superseded by a much more integrated approach, which takes account of the various types of use that are possible within a given territory. The different levels of action and governance, from local to global and vice versa, are also subject to investigation, with territories nevertheless being the preferred level of analysis. Above and beyond this, the relations between agriculture and the environment are seen as largely common to all our lines of research.

© O. Hébrard/CIRAD

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INVENTING SUSTAINABLE FARMING SYSTEMS THAT MAKE OPTIMUM USE OF AGRO-ECOSYSTEMS

Faced with the substantial range of farming situations worldwide, from industrial plantations to family-run smallholdings, CIRAD and its partners work with farmers to develop appropriate strategies. Agro-ecology, conservation agriculture, promotion of ecosystem services and biodiversity, participatory breeding, and integrated production are among the approaches used, depending on the situation, to boost agro-ecosystem performance and satisfy local people's need to change and ensure their security. The term "ecologically intensive agriculture" reflects these fields of research.

< ECOLOGICALLY INTENSIVE AGRICULTURE >

Crops on the slopes of the Empung volcano, Sulawesi, Indonesia © B. Locatelli/CIRAD

Jean-Michel Risède is Head of the Banana, Plantain and Pineapple Cropping Systems Internal Research Unit

West Indian bananas could inspire others

The first phase of the *Plan Banane Durable* (sustainable banana plan) has just been completed in the French West Indies (PBD1). It has been such a success that a second phase (PBD2), which has been extended to cover the Caribbean, is now being drafted.

What conclusions can you draw from PBD1?

Jean-Michel Risède: As early as 2011, PBD1 had already enabled a 50% reduction in pesticide use in plantations in Guadeloupe and Martinique, by virtue of the development and transfer of cropping innovations and alternative, more sustainable production methods. This success was achieved thanks to CIRAD's scientific background and its fruitful collaboration with the production chain in the West Indies. Farming practices and landscapes in the islands have changed, as so-called "service" plants are now being grown at the foot of the banana plants in almost 20% of plantations. This serves to reduce the need for pesticides and chemical fertilizers. PBD1 has been such a success in the West Indies that a second phase is currently being drafted, with greater emphasis on regional cooperation with the Caribbean.

PBD2 will be launched in 2014; what are its main objectives?

J-M.R.: The aim is to continue to build and disseminate the innovations developed and address the major challenge of ensuring sustainable production, despite the recent advent of black Sigatoka disease*. Controlling the fungus means developing an integrated set of solutions, notably including the assessment and promotion of alternatives to aerial treatments and the stepping up of the development of varieties that are disease-resistant and compatible with export standards and satisfy consumer demand.

The two phases of the PBD fit into an overall "Sustainable Banana" approach. What is it based on?

J-M.R.: The approach set out to reduce the adverse environmental impacts of banana plantations. The operational framework is a network of partners working to innovate, involving all the stakeholders in the banana supply chain: research (CIRAD), the Institut technique tropical (IT2) and producers. The resulting participatory interactions are materialized in two technological innovation platforms: one to design and assess cropping systems, and the other to develop and breed new varieties. ■

Banana plants and a service plant, *Arachis pintoi* © Hoa Tran Quoc/CIRAD

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Dominican Republic > Ministry of Agriculture, producers' groups (Adobanani, Coopabando)

Guadeloupe, Martinique > IT2, UGPBAN. Winwards

Saint Lucia, Saint Vincent, Dominica > Ministry of Agriculture, National Fairtrade Organization, etc

* A fungal disease also known as black leaf streak, first seen in Martinique in 2010 and in Guadeloupe in 2012.

Rubber: intercropping with coffee or cocoa is more profitable than monocropping

Intercropping several tree crops is not only possible, but profitable. This was recently demonstrated by researchers from CIRAD and their partners in Ivory Coast who spent 17 years monitoring a trial in which rubber was grown with other tree crops. The results showed that the hevea-coffee and hevea-cacao associations were significantly more profitable than other associations until the 12th year. The additional gross margins were positive from the third year on for the hevea-coffee association and from the fourth year on for hevea-cocoa association. Grown as a monocrop, hevea only reached the breakeven point in the eighth year. During the 17-year observation period, both the hevea-coffee and hevea-cacao association were more profitable than the standard hevea monocrop; but after the 13th year, the difference was no longer significant. This type of cropping system is a way of diversifying farmers' incomes and reducing their cash flow constraints while waiting for latex production to start. Such cropping systems can generate real added value. ■

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[FOR FURTHER INFORMATION] Snoeck D., Lacote R., Keli Z.J., Doumbia A., Chapuset T., Jagoret P., Gohet E., 2013. Association of hevea with other tree crops can be more profitable than hevea monocrop during first 12 years. *Industrial Crops and Products*, 43: 578-586. Doi: 10.1016/j.indcrop.2012.07.053

Intercropping rubber with cocoa is much more profitable than rubber monocropping up until year 12 © R. Lacote/CIRAD

Coffee, shade trees and erosion in Costa Rica: sustainable, high-yielding cropping systems

Plot of coffee trees in the shade of *Erythrina poeppigiana* © B. Rapidel/CIRAD

In central Costa Rica, coffee trees, intercropped with shade trees, are grown on steep slopes, resulting in significant soil erosion. By using a typology of farming practices, combined with a cropping system design model, a team from CIRAD succeeded in developing agroforestry systems that mitigate this erosion, based on the complex relations between coffee trees and their environment. The team worked with a local coffee cooperative to test a novel way of identifying the constraints of and key variables for managing agroforestry systems and their performance. The approach involved using a typology of practices to develop conceptual models that reflected the diversity of plot situations. It can serve to design and test cropping systems aimed at responding better to the constraints on farmers. It can also act as a basis for discussions with farmers as part of participatory approaches. The method also has the advantage of requiring little time and few data, although in the case of perennial crops, a second survey to update on practices may be necessary the following year. ■

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This work was carried out within the Scientific Platform in Partnership on "Agroforestry Systems with Perennial Crops" in Mesoamerica.

[FOR FURTHER INFORMATION]

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Tomatoes in Mayotte: pest attacks and pruning are penalizing yields

Staked, pruned tomato plants under coconut palms © J. Huat/ CIRAD

In Mayotte, tomatoes are primarily grown in the open, with extremely variable yields. Pest and disease attacks are the main reason for this variability, but crop management also plays a role, as both pruning and deshooting are practised. A team from CIRAD conducted a survey of market gardeners on the island and came up with ways of improving yields. According to the analyses, the main explanatory factor was crop health. Although market gardeners used pesticides, they had little effect on plant health. The researchers observed that the market gardeners did not generally use pesticides correctly, often using too high or too low a dose, or ineffective active ingredients. The second factor affecting yields was planting density. Again, deshooting and pruning, consisting in keeping just two or three fruit-bearing stems on each plant, regardless of the planting density, tended to limit the number of fruits per plant, hence yields. In the first case, the solution would be to make market gardeners more aware of how to use pesticides and control measures correctly, to help them fight sanitary problems effectively and reduce the risks for the environment and themselves. In the second case, the researchers recommended, amongst other things, increasing planting density, keeping two or three stems per plant, or increasing the number of stems per plant, by not pruning. ■

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[FOR FURTHER INFORMATION]

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Oil palm: organic waste recycling and soil fertility

Applying bunch stalks in an Indonesian plantation © J.P. Caliman/CIRAD

In Indonesia, growers use the waste from palm oil extraction to fertilize their plantations, with a positive effect on production. However, what are the long-term effects on soil characteristics? Researchers from CIRAD and their peers set out to answer this question by analysing soils from a vast plantation, representative of the range of conditions in which oil palm is grown, using a set of data recorded over a seven-year period. The study confirmed that continuously applying organic products improved soil characteristics, particularly those of sandy soils: their pH increased by 0.55, their carbon content was multiplied by 1.6 and their nitrogen content doubled, resulting in a better cation exchange capacity. However, alternations, however minimal, between organic and inorganic fertilizer applications cancelled out or at least significantly reduced that beneficial effect. On sandy loam soils, the improvement in organic carbon and nitrogen contents appeared to be more stable, even in the event of alternate organic and inorganic applications. Growers can optimize their use of waste by giving priority to regular organic product applications on sandy soils, which are the most fragile. This practice has a long-term beneficial effect on soil physicochemical quality and reduces the risks of mineral losses due to leaching. Further studies are under way to include the "soil biological fertility" component in such assessments. ■

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Indonesia > PT Smart Research Institute (Smartri)

[FOR FURTHER INFORMATION] Comte I., Colin F., Grünberger O., Follain S., Whalen J., Caliman J.P., 2013. Landscape-scale assessment of soil response to long-term organic and mineral fertilizer application in an industrial oil palm plantation, Indonesia. Agriculture Ecosystems and Environment, 169: 58-68. Doi: 10.1016/j.agee.2013.02.010

La palme des controverses: palmier à huile et enjeux de développement

Alain Rival (CIRAD) and Patrice Levang (IRD) have co-published a book with Editions Quae, presenting the development issues surrounding the palm oil production and processing chain.

The authors – a biologist and an agro-economist – describe in this book a complex, globalized supply chain whose stakeholders often have conflicting interests. Oil palm has become symptomatic of the shift in North-South relations within the agricultural development sphere. Palm oil is produced and consumed in southern countries. The development of the palm oil trade has been sustained by emerging countries, but it is still in the North that most processing takes place and the major agrifood multinationals are based. It is also in the North that the most ethical and environmental questions are being asked.

The public controversy about palm oil is often fuelled by very cut-and-dried, often exaggerated views. The authors of this book hold more qualified opinions, backed up by scientific data and shared experience of the realities in the field. The book allows readers to forge a more balanced opinion, by shifting the focus to the South, the only palm oil production zone and the main consumption zone. ■

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La palme des controverses : palmier à huile et enjeux de développement. Alain Rival, Patrice Levang. Editions Quae. 2013.

Genetic diversity of sweet potato *(Ipomoea batatas)* in Papua New Guinea

Papua New Guinea is the second largest genetic diversity centre for sweet potato *(Ipomoea batatas)*, a tuber that originated in Latin America. More than 1000 sweet potato varieties are grown there by smallholders. But where did the diversity observed for this vegetatively propagated plant, always grown from cuttings, come from?

To answer that question, researchers from CIRAD and CEFE studied the genetic diversity of 417 local varieties using molecular markers, and compared the results with those for a sample from Latin America. The results showed 1) the extent of the diversity in PNG, albeit less substantial than that in the species' area of origin, 2) that most of the varieties from the region mostly came from the central American domestication centre, rather than from South America, and 3) that most of the varieties were bred locally from plants resulting from sexual recombination that appeared spontaneously in plots (natural reproduction from seed). Even very isolated smallholders left to their own devices are thus quite capable of cloning plants to create local varieties of an introduced exotic species by vegetative propagation. The sustainability of the system relies on the introduction of allelic diversity and on participatory breeding. ■

Sweet potatoes are the staple food crop for local people in Melanesia, since they are rich in carotenes and anthocyans © V. Lebot/CIRAD

In Melanesia (PNG, Solomon Islands, Vanuatu), smallholders select local sweet potato varieties, some of which, being well suited to local conditions locales, produce very high yields © V. Lebot/CIRAD

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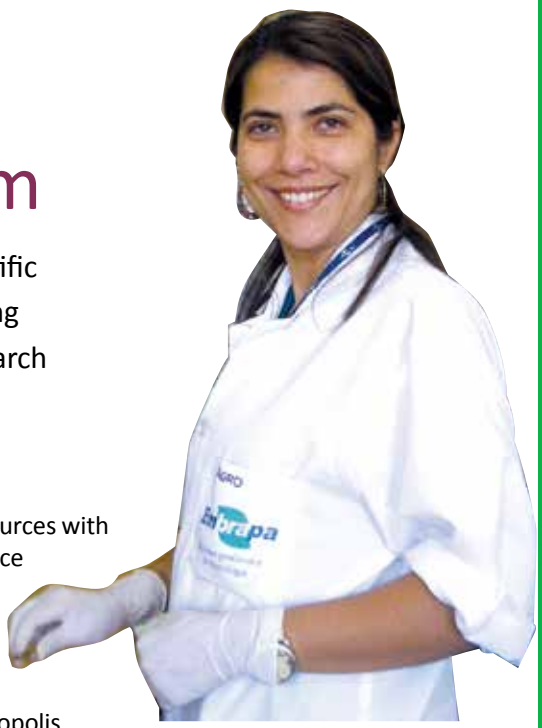
Papua New Guinea > NARI, National Agricultural Research Institute, LAE

[FOR FURTHER INFORMATION] Roullier, C., R. Kambouo, J. Paofa, D. McKey and V. Lebot. 2013b On the origin of sweet potato (Ipomoea batatas (L.) Lam) genetic diversity in New Guinea, a secondary centre of diversity. Heredity. 110 (6):594-604

Plant genetics at the heart of an international consortium

The CIBA consortium structures cooperation between the Brazilian scientific network centring on EMBRAPA and the Franco-European network centring on Agropolis. It encompasses an exceptional range of plant genetics research and training platforms.



Ana Brasileiro is a researcher with EMBRAPA-CENARGEN (Brazilian Agricultural Research Corporation – genetic resources and biotechnology). She specializes in plant functional genomics

What is the International Advanced Biology Consortium (CIBA)?

Ana Brasileiro: CIBA specializes in the study and use of the diversity of plant genetic resources with a view to identifying characters of agricultural interest, particularly water stress tolerance and parasite resistance.

Tell us about the latest highlights of CIBA's work...

A.B.: The biggest success of 2013 was obtaining a joint commitment on the part of three partners, notably in terms of funding, to launch an invitation to tender. EMBRAPA, Agropolis Fondation and CAPES (coordination of high-level staff training in Brazil) reached a tripartite agreement. We are hoping to launch the call for projects in 2014. It will concern varietal improvement of tropical crops as regards biotic and abiotic stress. The topic is deliberately broad-ranging, so as to be able to choose the most ingenious projects.

What are the advantages of this platform?

A.B.: The consortium makes it easier to share knowledge, resources, and also genetic material. And with CIRAD as an intermediary, CIBA is now open to new African partners (WECARD, FARA, universities, etc). Lastly, transnational collaboration makes it possible to make applications under international invitations to tender such as the CGIAR Challenge Programmes. ■

PARTNERS

Africa > WECARD, FARA, agricultural research and development organizations, universities

Brazil > EMBRAPA, universities, technical organizations

France > members of Agropolis, notably the IRD, INRA, University of Montpellier

Latin America > universities, agricultural research and development organizations

6-8 November, Bahia, Brazil

CIBA 2013: Biotic and Abiotic Stress Tolerance in Plants

"Biotic and Abiotic Stress Tolerance in Plants: the Challenge for the 21st Century" was the topic for this workshop, organized by EMBRAPA, the State University of Santa Cruz (UESC, Ilheus-Bahia), CIRAD and the IRD. The symposium, which was attended by more than 150 people, set out to inventory research projects looking at biotic and abiotic stress resistance in plants of joint interest to both Brazilian and French teams, using genomics, physiology and genetics approaches. Twelve scientists from UMR AGAP were among the fifteen French participants. ■

CONTACT Pierre Marraccini, coordinator of the CIBA PP, Genetic Improvement and Adaptation of Mediterranean and Tropical Plants (UMR AGAP)

http://www.ciba2013.net

The symposium participants © P. Marraccini/CIRAD

Yes, we can... convert grasslands into cocoa plantings

Cocoa growing is generally seen as one of the factors in the deforestation of humid tropical zones. However, in central Cameroon, on the contrary, it can help with reforestation: in the region, many farmers set up their cocoa plantings on grasslands. To be able to do this, they have invented complex agroforestry systems in which food and fruit crops, forest trees, palms and cocoa trees are combined and succeed each other. Researchers from CIRAD and their partners in Cameroon have analysed the functioning of these cocoa plantings, which, with similar yields to plantings set up on forest land, are an example of successful ecological intensification. These agroforestry systems enable farmers to restore degraded grassland soils and produce as much raw cocoa as in forest cocoa systems, without any inputs and in conditions that are theoretically unsuitable for cocoa. These agroforestry practices could be a valid response to the climate change Africa is set to experience in the future, by maintaining production in a context that will be less favourable to cocoa growing. ■

Cocoa agroforestry systems planted on grassland associate oil palms, fruit trees and forest trees, which provide the shade required for the young cocoa trees
© P. Jagoret/CIRAD

CONTACT

Patrick Jagoret, Montpellier, France, Tropical and Mediterranean Cropping System Functioning and Management (UMR SYSTEM);
Didier Snoeck, Montpellier, France, Performance of Tree Crop-Based Systems

PARTNERS

Cameroon > Institut de recherche agricole pour le développement (IRAD)

France > Montpellier SupAgro

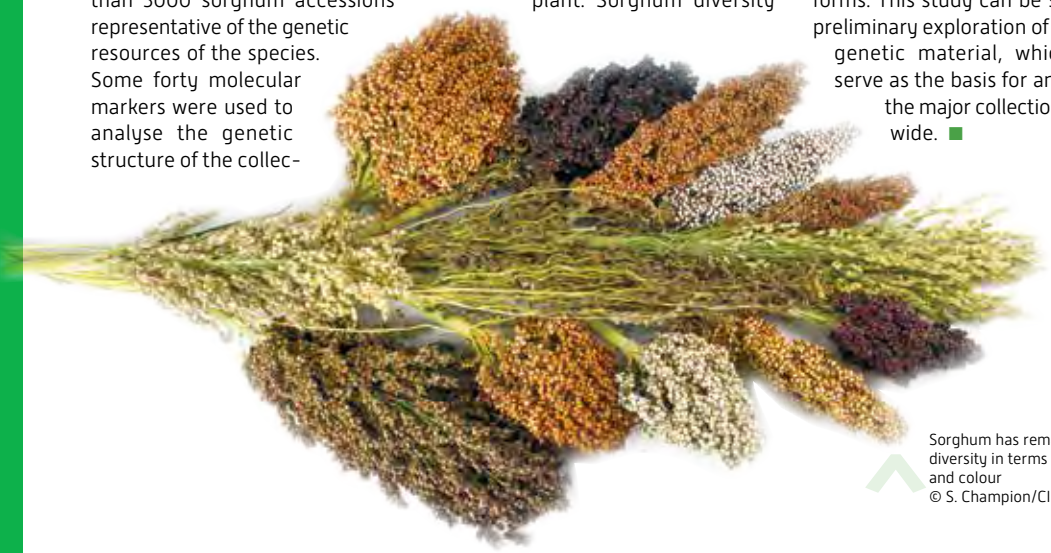
This work was carried out within the PCP Agroforesterie-Cameroun (PP)

[FOR FURTHER INFORMATION]

Jagoret P., Michel-Dounias I., Snoeck D., Ngnogué H.T., Malézieux E., 2012. Afforestation of savannah with cocoa agroforestry systems: small-farmer innovation in central Cameroon. Agroforestry Systems, 86: 493-504. Doi: 10.1007/s10457-012-9513-9

Genetic resources: more than 3000 sorghum varieties have been analysed

In order to manage and use large genetic resource collections effectively, it is vital to determine the genetic and morphological characteristics of the material conserved. A CIRAD team recently completed a vast study of a collection of more than 3000 sorghum accessions representative of the genetic resources of the species. Some forty molecular markers were used to analyse the genetic structure of the collection and determine how sorghum diversity is organized. The study was conducted under the CGIAR Generation Challenge Programme, and is one of the most wide-ranging studies ever undertaken into the genetic diversity of a cultivated plant. Sorghum diversity has thus apparently been largely determined by man of the species in several directions from its centre of origin, by breeding for worthwhile characters and through gene exchanges between races and wild forms. This study can be seen as a preliminary exploration of sorghum genetic material, which could serve as the basis for analyses of the major collections worldwide. ■



Sorghum has remarkable diversity in terms of ear shape and colour
© S. Champion/CIRAD

CONTACT

Claire Billot, Montpellier, France, Genetic Improvement and Adaptation of Mediterranean and Tropical Plants (UMR AGAP)

PARTNERS

Bioversity International

CGIAR Generation Challenge Programme (GCP)

Chinese Academy of Agricultural Sciences (CAAS)

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

[FOR FURTHER INFORMATION]

Billot C., Ramu P., Bouchet S., Chantereau J., Deu M. et al., 2013. Massive sorghum collection genotyped with SSR markers to enhance use of global genetic resources. *PLoS One*, 8: e59714. Doi: 10.1371/journal.pone.0059714

www.genesys-pgr.org/

A comprehensive study has confirmed the genetic structure of African coffee genotypes

The species Coffea canephora, which produces Robusta coffee, has substantial genetic diversity, which could almost certainly be better exploited in breeding programmes were it characterized better. A team from CIRAD recently analysed that diversity using microsatellite markers. This was the first truly comprehensive genetic study of the species. It confirmed the existence of diversity groups, analysed the relations between them and determined the genetic structure of the species, particularly the role played by refuge zones during the last glacial maximum and the effect of human intervention on its construction. The results are crucial for the management and use of genetic resource collections. Most coffee collections, apart from the one in Ivory Coast, represent relatively little diversity, and this is a handicap as regards genetic improvement of the species. The knowledge acquired of the variability of the species should serve to remedy the situation, by enabling the introduction of new genetic materials from under-exploited sub-groups, which will complement the existing collections and broaden the genetic base of breeding programmes. ■

Coffee trees from the Congolese group © T. Leroy/CIRAD

Coffee trees from the Guinean group © T. Leroy/CIRAD

Hybrid coffee trees © T. Leroy/CIRAD

CONTACT

Thierry Leroy, Montpellier, France, Genetic Improvement and Adaptation of Mediterranean and Tropical Plants (UMR AGAP)

PARTNERS

Brazil > Instituto Agronômico do Paraná (IAPAR)

France > Nestlé

Ivory Coast > Centre national de recherche agronomique (NNR)

Uganda > National Agricultural Research Organisation - Coffee Research Centre (NARO-COREC)

[FOR FURTHER INFORMATION]

Cubry P., De Bellis F., Pot D., Musoli P., Leroy T., 2013. Global analysis of Coffea canephora Pierre ex Froehner (Rubiaceae) from the Guineo-Congolese region reveals impacts from climatic refuges and migration effects. *Genetic Resources and Crop Evolution,* 60: 483-501. Doi: 10.1007/s10722-012-9851-5

An advanced technique guaranteeing millions of true-to-type coffee plantlets

Micropropagation using embryogenic suspensions entails risks of genetic and epigenetic instability. To minimize those risks in coffee, researchers from CIRAD and their partners have come up with a new culture protocol that was recently successfully tested. With some 800 000 in vitro plantlets observed individually and fewer than 1% non-true-to-type plantlets, they concluded that micropropagation from cell suspensions was fully mastered. That conclusion was confirmed by analyses of 145 plants using AFLP and MSAP markers, which revealed very low polymorphism between the elite mother plant and its progeny propagated in vitro. This study is also one of the first to have shown that under perfectly controlled conditions, it is possible to regenerate large quantities of true-to-type plants. Somaclonal variations are no longer inevitable. This is good news for breeders, who will now be able to use the technique to propagate varieties on an industrial scale. ■

Coffea arabica F1 hybrids in an agroforestry system in Nicaragua (La Cumplida finca). The plants were propagated using a somatic embryogenesis procedure that made use of embryogenic suspensions © B. Bertrand/Cirad

CONTACT

Hervé Etienne, Montpellier, France, Plant Resistance to Parasites (UMR RPB)

PARTNERS

Colombia > Centro Nacional de Investigaciones de Café

France > Institut de recherche pour le développement (IRD); Institut national de la recherche agronomique (INRA)

Mexico > Centro de Investigacíon y de Estudios Avanzados (CINVESTAV)

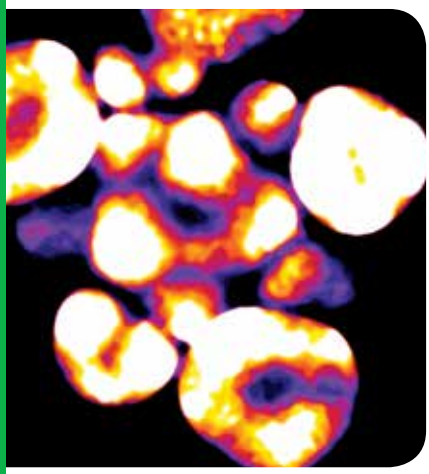
[FOR FURTHER INFORMATION]

Bobadilla Landey R., Cenci A., Georget F., Bertrand B., Camayo G., Dechamp E., Herrera J.C., Santoni S., Lashermes S., Simpson J., Etienne H., 2 013. High genetic and epigenetic stability in Coffea arabica plants derived from embryogenic suspensions and secondary embryogenesis as revealed by AFLP, MSAP and the phenotypic variation rate. *PLoS One,* 8: e56372. Doi: 10.1371/journal.pone.0056372

Behind the mathematical beauty of plant whorls...

A new mechanism that regulates phyllotaxis (the way in which plants arrange their organs in spirals or whorls) was recently revealed. Until now, the standard model was based on the notion of "inhibitory fields", whereby each organ, by consuming a growth hormone (auxin) prevents other organs from developing nearby.

By studying a mutant plant for a gene that regulates cytokinins (another class of hormones), researchers observed unexpected disruptions to these phyllotactic patterns that were apparently incompatible with the standard model. A quantitative study subsequently showed that those disruptions actually followed a remarkable order: 95% were due to sometimes very intricate permutations in organs along the axis. Those permutations were due to a mechanism that regulates the interval between consecutive organs (plastochron). The mechanism, which was altered in the mutant plant, led to co-initiations and then, after growth, to the permutations observed. The standard model has thus been revised, demonstrating the contribution made by cytokinin regulation to the robustness of the system and to the emergence of remarkable organ symmetry along plant axes. ■



False colour visualization of the "field" produced by protein AHP6 concentration in the meristem (organ initiation site), which regulates cytokinin signalling. This field overlaps with the auxin field and contributes to the stability of the plant plastochron

CONTACT Christophe Godin, Montpellier, France, Genetic Improvement and Adaptation of Mediterranean and Tropical Plants (UMR AGAP)

[FOR FURTHER INFORMATION]
Guédon Y., Refahi Y., Besnard F., Farcot E., Godin C. and Vernoux, T. (2013) Pattern identification and characterization reveal permutations of organs as a key genetically controlled property of post-meristematic phyllotaxis. *J Theor Biol,* 338, 94–110

http://www.nature.com/nature/journal/v505/n7483/full/nature12791.html

Soil fertility: survey of farmers' practices in Mali

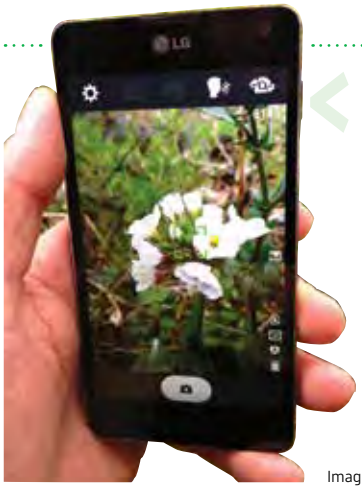
Soil fertility is under substantial pressure in southern Mali. Huge population growth and booming cotton and livestock production sectors are steadily exhausting agricultural land. To sustain and diversify their agro-pastoral activities, farmers do not have any other option than to produce organic fertilizer from crop residues and animal manure from their farms. How do they manage production, what technical knowledge do they use, what rationale, and what are the constraints on them and their objectives? A CIRAD team decided to investigate. The researchers initially came up with a way of analysing how farmers' managed soil fertility. Their novel method centred on farmers' technical knowledge in terms of organic fertilization and on monitoring its production and use. It was thus based on farmer surveys: types of fertilizer used, characteristics, functions, associated risks and uses. The method, which was combined with an analysis of soil and fertilizer organic matter and mineral composition, served to measure the efficiency of animal and plant biomass recycling and to understand the reasoning behind their management. ■

CONTACT Mélanie Blanchard, Montpellier, France, Livestock Systems and Animal Product Management (UMR SELMET) t)

PARTNER **Mali >** Institut d'économie rurale (IER)

[FOR FURTHER INFORMATION] Blanchard M., Vayssières J., Dugué P., Vall E., 2013. Local technical knowledge and efficiency of organic fertilizer production in South Mali: Diversity of practices. *Agroecology and Sustainable Food Systems,* 37: 672-699. Doi: 10.1080/21683565.2013.775687

Livestock hangar in the village of Dentiola, Mali © M. Blanchard/CIRAD



Interactive plant identification using images from social networks

Identifying plants is a major obstacle to more efficient natural resource management. Researchers are therefore keen to establish effective systems open to all that enable the identification of a significant number of species. An interactive, collaborative plant identification tool was developed, based on analysing images, and has since been continually supplemented by the members of a botany social network. The system, which was launched on the Internet in 2011, and subsequently for smartphones (Feb. 2013 for iPhone, Jan. 2014 for Android), now works for more than 4000 plant species belonging to the flora of France. It is one of the most extensive automatic systems ever developed. It is also the first plant identification system by image analysis that can simultaneously handle several shots of a given plant (leaf, flower, fruit, bark). Some of the data gathered are now being used in an international evaluation of multimedia plant identification systems called PlantCLEF, which over the past four years has associated IT research teams from all over the world (Brazil, Turkey, China, Japan, etc).

CONTACT Pierre Bonnet, Montpellier, France, Botany and Computational Plant Architecture (UMR AMAP)

PARTNERS **France >** Agropolis Fondation, INRA, INRIA, IRD, Tela Botanica.

Image acquisition in the field, using the Pl@ntNet-Mobile app (Android version) © P. Bonnet/CIRAD

Sharing experience and know-how in farmers' groups

Meeting of agricultural machinery users in Gard, France © F. Goulet/CIRAD

Studies of the development of agro-ecological farming systems generally converge towards two observations. The first is that farmers' groups play a crucial role in developing agro-ecological technical systems. The second concerns the fact that local knowledge among farmers lies at the heart of the design of such systems, and that one of the main functions of these groups is precisely to foster the exchange of know-how and experience between farmers. Following the research he conducted in France with farmers' groups practising direct seeding (no-till), a sociology researcher from CIRAD suggested conducting an analysis to look more closely at these two main observations. The results suggest it is necessary to take account of the range of players involved in technical change, and to look beyond the rather reductive way in which alternative agricultural practices are often associated with independent farmers' groups. They illustrate the role played by agricultural suppliers (machinery, inputs) in the organization and day-to-day running of farmers' groups. Moreover, by demonstrating that before being shared, local knowledge has to be tested to determine whether it can be extrapolated to other situations, they show the need to look again at the traditional dichotomy between academic knowledge and local knowledge. ■

Farmers being trained in no-till and soil functioning by a private adviser in Deux-Sèvres, France © F. Goulet/CIRAD

CONTACT Frédéric Goulet, Buenos Aires, Argentina, Innovation and Development in the Agriculture and Agrifood Sector (UMR INNOVATION)

[FOR FURTHER INFORMATION]
Goulet F., 2013. Narratives of experience and production of knowledge within farmers' groups. *Journal of Rural Studies*, 32: 439-447. Doi: 10.1016/j.jrurstud.2013.09.006

Published in 2013

Qu'est-ce que l'Ecologically Intensive Agriculture ?

Michel Griffon. Ed. Quae, 2013

According to Michel Griffon, plentiful agricultural production is possible... while improving the quality of the environment. In this book, he presents the various specificities of ecologically intensive agriculture, explains the evolution of the concept, and details the means to expand the use of ecological functionalities for agriculture and animal production. He looks at the conditions for global economic and social viability, which is key to the success of this new type of agriculture. The book is backed up by a broad range of experiences, and should fuel the debate between agricultural and environmental professionals, in order to ensure that farmers themselves become champions of the agricultural biosphere.

Les adventices des Antilles françaises

T. Le Bourgeois, E. Dumbardon-Martial, L. Gervais, F. Grossard.
Abymes: CTCS-Guadeloupe, 2013.

This guide describes the main weeds found in the West Indies, in the hope of enabling better management of weed growth issues in the region.

It was produced with a broad readership in mind: farmers, management staff, researchers and students. It covers 50 dicots and 20 monocots most representative of the crops grown in Guadeloupe and Martinique. It is supplemented by Adventilles Network, a collaborative web platform.

http://community.plantnet-project.org/pg/groups/6185/adventilles-network-les-adventices-des-cultures-des-antilles/

Perspective 24. Insect pest control in agriculture – Changing scale: from field to landscape

François-Régis Goebel

Fighting against increasing pest and disease pressure while significantly reducing pesticide use means taking action not just on a plot level but on a landscape level.

http://www.cirad.fr/publications-ressources/edition/perspective-policy-brief

Les fruits sous-utilisés en Afrique

This special issue of the journal Fruits is devoted to Africa, a continent particularly hard-hit by malnutrition, for which underutilized species are a particular challenge. It includes fifteen recent articles already published in the journal, and is the second issue devoted to agro-biodiversity and underutilised species.

The journal Fruits *is a bi-monthly scientific publication containing original articles and synopses on the results of international fruit research. It is published jointly by CIRAD and EDP Sciences and recognized by the ISHS.*

http://journals.cambridge.org/action/displaySpecialPage?pageId=4760

Rubber at the heart of a platform

From rubber plantations to socioeconomic studies, the Hevea Research Platform in Partnership (HRPP) associates scientists working at every stage of the rubber supply chain.

What are the advantages of working within a platform in partnership?

Siriluck Liengprayoon: Collaboration between disciplines and information circulation are much easier, notably during the HRPP's annual conferences. I specialize in rubber chemistry, but the platform enables me to discover the problems encountered in the field or issues relating to the economy of the supply chain. This is vital if we are to pinpoint research requirements and foster innovative ideas.

In 2013, you were able to build an extension to your laboratory, LipPolGreen-Asia, thanks to funding from Agropolis Fondation...

S.L.: Yes. And without the HRPP, LipPolGreen-Asia almost certainly wouldn't be here today, as this is the first time Agropolis has funded scientific equipment overseas. We see this as a clear sign of confidence in the HRPP. The LipPolGreen platform in Montpellier already had similar equipment, and we used to send our samples there for analysis. This posed several problems, notably when it came to conserving fresh samples. The LipPolGreen-Asia extension has made things much easier for us. And we are also counting on it to boost regional partnerships with Cambodia, Laos and Vietnam.

What are the HRPP's plans now?

S.L.: We have just mounted an international Masters programme backed up by the HRPP, and are waiting for an answer from the Ministry of Education in Thailand. Lastly, we are working to step up collaboration with the private sector, by contacting rubber plantation owners to tell them about our research. ■

Siriluck Liengprayoon (right of photo) is joint manager of the Natural Rubber Biochemistry and Technology Laboratory at Kasetsart University in Thailand. She worked on her PhD thesis at CIRAD, and now specializes in the chemical composition of rubber. © F. X. Sauvage/INRA

PARTNERS

Thailand > Kasetsart University, Prince of Songkla University, Ministry of Agriculture and Cooperatives Department of Agriculture (DOA)

Associate partners > IRD, INRA, BIOTEC, ORRAF

French universities: Clermont-Ferrand (Blaise Pascal), Montpellier II, Le Maine, Montpellier SupAgro

Thai universities: Ubon Rachatani, Khon Kaen, MaeJo, Mahidol

Website
hrpp.ku.ac.th

INNOVATING TOWARDS SUSTAINABLE NON-FOOD USES FOR BIOMASS

Non-food use of biomass is a major issue for sustainability. It concerns fuels, and also clothing, materials, bioproducts (and biopolymers), fertilizers and organic ameliorators. Biomass sources and processing techniques vary considerably, from the plant and animal products concerned to the resulting agricultural, agro-industrial and urban waste and residues that have to be recycled. The risks of competition with food use are triggering increasing tension. CIRAD's research aims to characterize the resources, assess the impact of their use, improve the processes used and structure the supply chains concerned, with a view to contributing to the development of rural communities.

< BIOMASS AND NON-FOOD USES >

Recovering bunch stalks in a palm oil mill in Sumatra, Indonesia © J.-P. Morin/CIRAD

Sorghum, a plant with a future in North and South

Delphine Luquet, an ecophysiologist, and David Pot, a geneticist, are two of CIRAD's sorghum specialists

Thanks to its substantial expertise in sorghum, CIRAD is involved in several projects on this unique grass species, notably ***Biomass For the Future***, a vast French programme funded by "Investissements d'avenir" and Biosorg, an Agropolis-Cariplo project.

You are currently involved in two new projects on sorghum...

Delphine Luquet: Yes, *Biomass For the Future* (BFF), which began in late 2012, aims to set up French supply chains (construction materials, plastics, combustion, biogas production) using biomass from two grasses: miscanthus and sorghum. The originality of this project relies on the association of ecophysiologists, geneticists, breeders, experts in materials science and life cycles, agronomists, farmers and process engineers, in order to optimize crop ideotype-industrial use combinations.

David Pot: The Biosorg project, which is coordinated by CIRAD*, aims to complement the BFF project, centred on biomass use, so as to meet the needs of developing countries, developing sorghum genotypes for multiple purposes (grain, sugar, biomass production), including human consumption.

How do they complement each other?

D.P.: The synergy between them relies mainly on the convergence of investment on joint experiments and trials. Furthermore, the projects' results will be complementary. Biosorg is a real exercise in linking a project initially intended for the North (BFF) with applications adapted for the South. This type of link between North/South projects is rare, but it is a challenge that CIRAD will increasingly have to address.

Other projects are under way on sorghum. What's so special about the plant?

D.L.: Sorghum is drought-resistant, and can also produce two to three times more fibre than most other grasses. But above all, it is a pillar of food security in many countries. Projects on the use of its biomass and its many purposes are a relatively recent development (EU FP7 Sweetfuel and S3F projects, 2008), and CIRAD is one of the leaders of this dynamic as it was already working on projects on sorghum's food uses. This is concrete proof of a strong commitment to this key species. ■

CONTACT Delphine Luquet, David Pot, Montpellier, France,
Genetic Improvement and Adaptation of Mediterranean and Tropical Plants (UMR AGAP)

* with the Parco Tecnologico Padano (Lodi, Italy).
David Pot is project coordinator.

http://www.biomassforthefuture.org/

Shea butter in Burkina Faso: less energy for better incomes and a sustainable supply chain

In Burkina Faso, shea butter is produced by women using a traditional process that is both labour- and energy-intensive. To boost the efficiency of the process, researchers from CIRAD and their peers have been looking at the way in which producers use energy, essentially firewood. The study was based on surveys and observations of several groups of gatherers and butter producers in eastern Burkina Faso. It measured precisely the energy and financial flows relating to current production processes, and what was taken from the environment. It also simulated the introduction of new techniques, testing several scenarios combining the different possibilities. By combining these simple innovations that are available locally and using the waste generated by shea nut processing as fuel, producers no longer need wood. This makes their work much less arduous and boosts their incomes considerably, while limiting the environmental impact of their activities. ■

CONTACT
Marie-Hélène Dabat, Montpellier, France, Actors, Resources and Territories in Development (UMR ART-DEV);
Joël Blin, Ouagadougou, Burkina Faso, Biomass, Wood, Energy, Bioproducts

Substantial amounts of firewood are required to process shea nuts
© E.S. Noumi/CIRAD

PARTNERS

Burkina Faso > International Institute for Water and Environmental Engineering (2iE); Secrétariat permanent de la Coordination des politiques sectorielles agricoles (SP-CPSA)

Denmark > Danish International Development Agency (DANIDA)

Cowi Consulting Group

[FOR FURTHER INFORMATION] Noumi E.S., Dabat M.H., Blin J., 2013. Energy efficiency and waste reuse: A solution for sustainability in poor West African countries? Case study of the shea butter supply chain in Burkina Faso. *Journal of Renewable Sustainable Energy,* 5: e0531341. Doi: 10.1063/1.4824432

A step towards guayule bio-refining: rapid rubber and resin content analyses using spectroscopy

Guayule, a shrub from the desert regions of the Americas, produces a rubber whose properties are particularly suited to medical uses, and also many other compounds for which there could be commercial outlets. Under the EU-Pearls project, CIRAD recently developed a rapid, precise method for analysing its biomass using near-infrared spectroscopy (NIRS). This analysis technique is used to predict the chemical composition of a sample, but must be precisely calibrated beforehand. This preliminary work requires a series of studies to select and optimize the extraction process, calibrate the analysis for each component and establish the corresponding calibration equations. More than 200 stem and branch samples from several guayule lines were analysed for both their moisture content and their rubber and resin content. The values obtained for both moisture and the extracts, hexane (rubber) and acetone (resins), enabled accurate characterization of guayule biomass. This development is a first step towards large-scale use of this plant, which contains many products. ■

Part of the "guayule" team: Daniel Pioch, Sunisa Suchat (PhD student) and Serge Palu (left to right) © S. Palu/CIRAD

CONTACT
Daniel Pioch, Serge Palu, Montpellier, France, Biomass, Wood, Energy, Bioproducts

PARTNERS

France > Centre de transfert de technologie du Mans (CTTM); Supagro Montpellier

Netherlands > Plant Research International BV

Thailand > Prince of Songkla University

European Union > EU-Pearls project

[FOR FURTHER INFORMATION]

Suchat S., Pioch D., Palu S., Tardan E., Van Loo E.N., Davrieux F., 2013. Fast determination of the resin and rubber content in Parthenium argentatum biomass using near infrared spectroscopy. *Industrial Crops and Products*, 45: 44-51. Doi: 10.1016/j.indcrop.2012.09.025

www.eu-pearls.eu

The challenges of fuelwood in central Africa

Africa is facing two major challenges linked to its soaring population: how to supply that population with ever more food and how to provide the energy they need to cook it. This means increasing agricultural land areas, often at the expense of forests, where soils are more fertile, and using the wood obtained by clearing forest as fuel. However, fallow is shrinking, soils are becoming poorer and wood is increasingly scarce: people have to go further and further from towns to find it. The Makala project on sustainable management of the fuelwood resource in central Africa, which was supported by the EU and coordinated by CIRAD, set out to understand and quantify the issue and come up with solutions to put a stop to the vicious circle. It was conducted from 2009 to 2013 in the Democratic Republic of Congo and the Republic of Congo. The resulting book assesses fuelwood consumption in cities and then lists vital tools for effective wood resource management. It suggests management models for the resource that were developed under the project and topics for debate in the hope of satisfying food and energy requirements in the region. ■

Preparing a charcoal stack in Congo © D. Louppe/CIRAD

CONTACT
Dominique Louppe, Montpellier, France, Tropical Forest Goods and Ecosystem Services

[FOR FURTHER INFORMATION]

Marien J.N., Dubiez É., Louppe D., Larzillière A., 2013. Quand la ville mange la forêt: les défis du bois-énergie en Afrique centrale. Quae

A less polluting firing method for terra cotta goods

In a first for the Biomass and Energy platform, a project associating the Terreal group and Béralmar and co-funded by the Languedoc Roussillon Regional Council and ADEME has succeeded in firing terra cotta construction materials using a synthetic gas produced from forest wood pellets, avoiding the pollution usually generated by natural gas. A CIRAD staged gasification reactor was coupled with a Terreal pilot firing oven via a Béralmar gas burner. The eventual aim is to replace up to 70% of natural gas with synthetic gas obtained from an abundant resource such as ligno-cellulose biomass. ■

CONTACT
Laurent van de Steene, Montpellier, France, Biomass, Wood, Energy, Bioproducts

Biomass and Energy platform © D. Louppe/CIRAD

21-23 November, Ouagadougou, Burkina Faso

4th International Conference on Biofuels

The conference, on the topic of "What is the current situation of and future for biofuels and bioenergies in Africa?", was co-organized by 2iE (International Institute for Water and Environmental Engineering), CIRAD and the Ministry of Mining and Energy in Burkina Faso. The challenge for African countries is to shift from domestic to modern use of biomass in order to access the production energy that is vital for the development of economic activities. ■

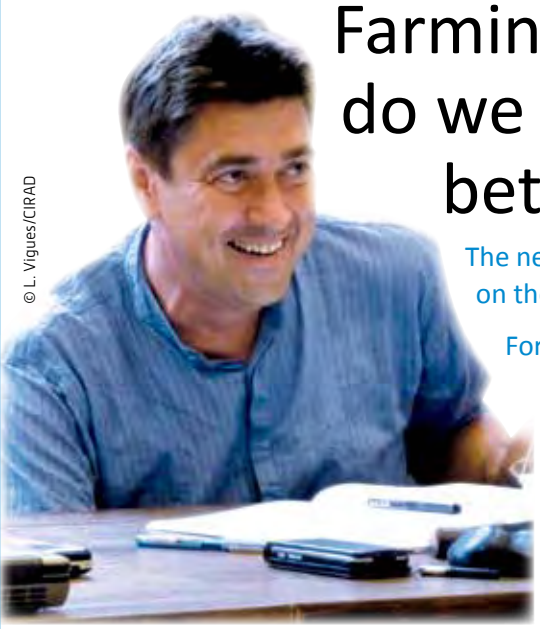
CONTACT Sylvie Mouras, Joël Blin, Ouagadougou, Burkina Faso, Biomass, Wood, Energy, Bioproducts

ENSURING FOOD SECURITY IN SOUTHERN SOCIETIES

Ensuring food security for all, and particularly for the world's most vulnerable people, means guaranteeing that everyone has the capacity to produce or buy the food they need (access), our ability to cover food requirements (availability), and also the consistency and quality (in its broadest sense) of our food. Urbanization, changing lifestyles, evolving standards and the intensification of international trade are all changing food supply systems, while increasing instability and vulnerability are forcing a rethink of their sustainability.

< SUSTAINABLE FOOD SYSTEMS >

Fish of the day at the Ver O Peso market, Belem, Brazil. © N. Cialdella/CIRAD



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Farming systems and food: do we need to look again at the links between them?

The new initiatives being taken every day by urban and rural inhabitants cast doubt on the current relations between agriculture and food.

For Nicolas Bricas*, a socioeconomist with CIRAD, they open the way for new lines of research into little-know approaches.

"The current insistence on 'feeding the world in 2050' tends to reduce the relations between agriculture and food to a simple link between supply and demand. However, the many local initiatives being taken by rural producers and urban consumers prove that those relations go much deeper than that. Direct sales from producer to consumer and other short circuits or farmers' markets, the Slow Food movement, use of organic and local products in canteens, promotion of artisan and local products in supermarkets, and so on... Even if these alternatives to the industrial system remain relatively marginal in volume terms, they reflect a move to look again at the relations between food and agriculture. The geographical, economic and knowledge gap between producers and consumers is a source of concern, and results in a need, on the part of consumers, to take control of what they eat. This phenomenon is not specific to rich countries. As their food becomes increasingly industrialized, urban inhabitants in developing countries are not just looking for the cheapest calories they can find. They have the same concerns about the quality of their food in terms of taste and safety, and whether it is natural. They want to know where it comes from, and already suspect industrialists of paying more attention to their profits than to their responsibilities, particularly since governments are largely incapable of controlling trade.

The multiplication of such initiatives is an issue for research. How do policy-makers, agricultural professionals and civil society see the relations between agriculture and food? How are those concepts changing and evolving in relation to each other over time? What are the processes of dissociation and (re)association of agriculture and food?

The famous question **"Will we be able to feed the world?"** is as relevant as it is simplistic. The planet is already producing enough to feed the nine billion people who will live on it by 2050. The issue is not just tailoring supply to demand in terms of quantity, but also the details of the relation between agriculture and food, in an environment in which the increasing scarcity of non-renewable resources will make it impossible to sustain our current society of plenty and wealth." ■

[FOR FURTHER INFORMATION]

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Controlling mycotoxins: a dual health and economic issue

Mycotoxins are toxins produced by certain types of mould, such as *Aspergillus*, *Penicillium* and *Fusarium*. They contaminate food products whose subsequent consumption may cause public health issues for man and reduced productivity in animals, and sometimes proves fatal. The resulting economic losses particularly affect products of tropical origin, since importing countries are now setting increasingly stringent health standards. A special issue of *Cahiers Agricultures* looks at the matter of mycotoxin contamination in four supply chains: cereals, groundnut, coffee and fish farming. It analyses the effect of cropping practices and ambient conditions on the development of the moulds responsible for mycotoxin production, and the impact of postharvest treatments. It also takes stock of the analytical techniques used to determine contaminant levels in food products, some of which could be of help in making decisions relating to this health and economic risk. ■

CONTACT Nadine Zakhia-Rozis, Montpellier, France, Deputy Director, PERSYST Department

Mouldy wheat © S. Galindo/UM2

[FOR FURTHER INFORMATION] Zakhia-Rozis N., Schorr-Galindo S. (ed.), 2013. Maîtriser les mycotoxines: un double enjeu, sanitaire et économique. *Cahiers Agricultures*, 22. Doi: 10.1684/agr. 2013.0632

Aspergillus on rice © F. Troude/CIRAD

Relations between urban markets and agriculture

For ten years now, the MALICA platform (Markets and Agriculture Linkages for Cities in Asia) platform has been studying the links between urban and rural areas in terms of agriculture and food. It set out to kill two birds with one stone: to adapt rural production to urban demand for quality products, hence reducing rural poverty.

Tan Loc Nguyen Thi is Head of the Economics Department at the Fruits and Vegetables Research Institute (FAVRI). She coordinated the MALICA platform for two and a half years.

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Can you tell us briefly about the MALICA platform?

Tan Loc Nguyen Thi: MALICA is a skills platform that associates researchers working on agricultural and food supply chains in Vietnam and Laos. Agriculture is of vital importance in these countries in terms of the economy and employment. We are working in particular on the domestic market that supplies cities. The huge potential for urban consumption can help maintain jobs in rural areas and boost average rural incomes through better marketing.

You recently began working with the CGIAR Humid Tropics programme...

T.L.N.T.: We took part in a diagnostic study of the North Vietnam/Eastern Laos/Yunnan (China) triangle, under the Humid Tropics programme. The eventual aim is to show how the China-ASEAN* free trade agreement will impact on agriculture and food supplies in Laos and Vietnam.

In 2013, you also celebrated MALICA's tenth anniversary. How has the platform changed in those ten years?

T.L.N.T.: To begin with, the priority topic was periurban agriculture. This then broadened to cover every type of urban supply chain. Since the avian influenza crisis in 2007, we have placed greater emphasis on quality aspects and consumer perception. We have also been working for several years now on organizing agricultural certification. In short, our constant aim is to help build sustainable food systems. ■

* Association of Southeast Asian Nations

PARTNERS

Laos > National University of Laos (Faculty of Agriculture)

Vietnam > Institute of Policy and Strategy for Agriculture and Rural Development; Vietnam Academy of Agricultural Sciencs

Website

www.malica-asia.com

1 February, Montpellier, France

Water, energy, land, jobs: what resources are required to feed towns sustainably?

This was the question set for debate by the UNESCO Chair in World Food Systems* at its 2nd International Symposium in Montpellier.

By 2025, there will be 27 cities with more than ten million people worldwide; by 2050, more than two thirds of the world's people will be living in cities. One of the major challenges for the future is how to feed those people sustainably, since the scientific community is agreed that the future will bring risks of non-renewable natural resource shortages, notably as a result of galloping urbanization. While respecting the aims of sustainable development, including the universal right to a quality diet, we will probably have to come up with new, better ways of producing our food. ■

CONTACT

Damien Conaré, Montpellier, France, Secretary General, UNESCO Chair in World Food Systems

* The UNESCO Chair in World Food Systems was established in Montpellier in 2011, and works on the biotechnical and social sciences and biological and cultural diversity. CIRAD is contributing to its task of sharing knowledge.

4-6 June, Yamoussoukro, Ivory Coast

AGRAR 2013, 1st Conference of African Research on Food and Nutrition

This event was organized by CIRAD, the West and Central African Council for Agricultural Research and Development (WECARD) and the Institut National Polytechnique de Yamoussoukro (INP FHB). It was part of an analysis network for factors in food crop supply, marketing and diversification (AFOMDnet), an ACP science and technology programme coordinated by CIRAD, associating agricultural research teams from Benin, Burkina Faso, Chad, Ivory Coast and Mali funded by the European Commission. The conference is due to be held every three years. ■

http://www.cirad.fr/en/news/all-news-items/articles/2013/evenements/conference-of-african-research-on-food-and-nutrition-agrar-2013

Fruit stall in Egypt
© D. Montet/CIRAD

Storing fruit and vegetables for longer thanks to photocatalysis

Each year, thousands of tonnes of fruit and vegetables are lost during transport and storage, for various reasons. The losses may be due to poor management of preservation techniques, resulting in physiological disorders and rapid changes in product quality. They may also be linked to product sanitary condition and the stage of ripening at which they were harvested, which impacts their integrity and metabolism. These easily identifiable factors are compounded by product ageing as a result of the presence of ethylene, a hormone that is naturally synthesized by plants and plays a major role in climacteric fruit ripening. As ethylene is diffused outside plants, its presence in a confined space increases the risk and rate of deterioration. Removing it from the surrounding air would give products a longer shelf life. Various solutions exist, including photocatalytic oxidation. Researchers from CIRAD and the CNRS have assessed the existing technologies, notably photocatalysis, which has real potential. ■

CONTACT
Jacques Joas, Montpellier, France,
Integrated Approach to Food Quality (UMR QUALISUD)

PARTNERS

France > Centre national de la recherche scientifique (CNRS); University of Lorraine.

[FOR FURTHER INFORMATION] Keller N., Ducamp M.N., Robert D., Keller V., 2013. Ethylene removal and fresh product storage, a challenge at the frontiers of chemistry: Toward an approach by photocatalytic oxidation. *Chemical Reviews,* 113: 5029-5070. Doi: 10.1021/cr900398v

22-28 September, Cerisy-La–Salle, France

Farming systems, food and globalization: paradoxes and controversies

The international symposium "Agricultures et alimentations dans un monde globalisé" addressed a paradox: globalization that has meant both "uniformization" and "differentiation" of products, lifestyles, technologies and territories, with this last example going as far as economic and social marginalization. The article refers to materials presented at the symposium to set out the hypothesis of the synchronized advance of "coming together, concentration and uniformization" and "separation, dispersion and differentiation". The exercise was worthwhile in that it characterized two contradictory movements on which two concepts of the future for agriculture and food worldwide are based, two contrasting visions that have triggered the main current controversies and an urgent need to overcome them if we are to make progress. ■

CONTACT Bruno Dorin, New Delhi, India,
Centre international de recherche sur l'environnement et le développement (UMR CIRED)

[FOR FURTHER INFORMATION]
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http://cerisy2011.cirad.fr

Managing food price instability in developing countries

Following the 2008 crisis, which saw food prices soar and urban riots break out in several developing countries, a study looked at the validity of the liberal doctrine that had become dominant since the late 1980s as regards managing food prices. The study, coordinated by CIRAD and conducted by some fifteen European experts, set out to summarize the existing theoretical and practical knowledge of the issue and conduct a critical analysis of the various options available, particularly the current dominant doctrine. The main field of application for these results relates to agricultural, trade and food security policy in developing countries, but they also have implications on a global scale: they cast doubt on regulations that "punish" the policies adopted by countries, particularly those of the WTO. They also plead in favour of continuing the debate on introducing initiatives to improve global market functioning: improving stock information, regulating derivatives markets more, rethinking biofuel promotion policies, and establishing global staple food stocks. ■

CONTACT
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Markets, Organizations, Institutions and Stakeholders' Strategies (UMR MOISA)

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Netherlands > University of Wageningen

United Kingdom > Natural Resources Institute (NRI)

Agrinatura (European Alliance on Agricultural Knowledge for Development)

[FOR FURTHER INFORMATION]

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http://www.afd.fr/webdav/shared/PUBLICATIONS/RECHERCHE/Scientifiques/A-savoir/17-A-Savoir.pdf

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Grain and spice stall at the market in Moroni, Comoro Islands
© V. Porphyre/CIRAD

UNDERSTANDING, ANTICIPATING AND MANAGING THE RISKS LINKED TO ANIMAL AND PLANT PESTS AND DISEASES

Increased trade, climate change and population pressure are all factors that are speeding up the changes in the threats to animals and plants (pathogens, pests and weeds). More global, integrated approaches ("one health" or "global health") can help boost our understanding and management of the impact of pests and diseases, while preserving the environment and human health.
The aim is to globalize the production of knowledge while coming up with solutions that are effective locally. The issues are as much biological and ecological as economic and human.

< ANIMAL AND PLANT HEALTH >

In Zimbabwe. © A. Perrotton/CIRAD

"Social and economic factors are major determinants of the life of a disease"

Avian influenza: what human science can contribute

François Roger, Head of the Animal and Integrated Risk Management Research Unit, recommends integrating human science into epidemiology. Several results, notably concerning avian influenza, have proved the merits of such an interdisciplinary and intersectorial approach.

Your unit's research has shown that social and economic factors are major determinants of the spread of avian influenza...

François Roger: Yes, this work[1], by one of our PhD students, was based on long, detailed surveys of stakeholders in traditional poultry marketing chains in Thailand. The analysis of those surveys provided a description of how exchanges take place between the various players and enabled a better understanding of the socioeconomic factors that determine how the disease spreads in rural areas. These results are important for optimizing avian influenza surveillance systems.

You have even gone one step further, using innovative epidemiology models...

F.R.: Yes, we analysed surveillance systems using loop analysis models, which come from the field of ecology. We thought of using them for epidemiology studies so as to integrate biological, ecological and socioeconomic parameters. As far as we know, this is a first in our field. The results[2] show that surveillance systems can be sketched using these methods. We are going to look further into this with a student specializing in modelling. The idea is to make the model more complex so as to stick as closely to reality as possible. This is a great tool for integrating different disciplines.

Is involving human and social science in epidemiology something new?

F.R.: Yes, relatively. It is a trend that comes from the Anglosphere. It is increasingly clear that the social factors (livestock production practices, movements, behaviour in relation to the disease, etc) that determine the life of a disease, from its appearance to its establishment, through its spread, are vitally important. This is particularly true for avian influenza, which is closely linked to human activity, especially trade. Moreover, human science also has a lot to teach us in terms of methodology. For instance, in recent years, we have been developing participatory approaches[3] drawn from sociology. For people like us, working with farmers, it is vital to associate them with our research, as who knows more about animals than they do? ■

PARTNERS

Cambodia > National Veterinary Research Institute (NaVRI)

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International > Food and Agriculture Organization of the United Nations; World Organization for Animal Health (OIE)

Kenya > International Livestock Research Institute (ILRI)

Thailand > Asian Institute of Technology (AIT); University of Kasetsart

Vietnam > Ministry of Agriculture and Rural Development, Department of Livestock Husbandry; National Institute of Veterinary Research (NIVR)

[FOR FURTHER INFORMATION]

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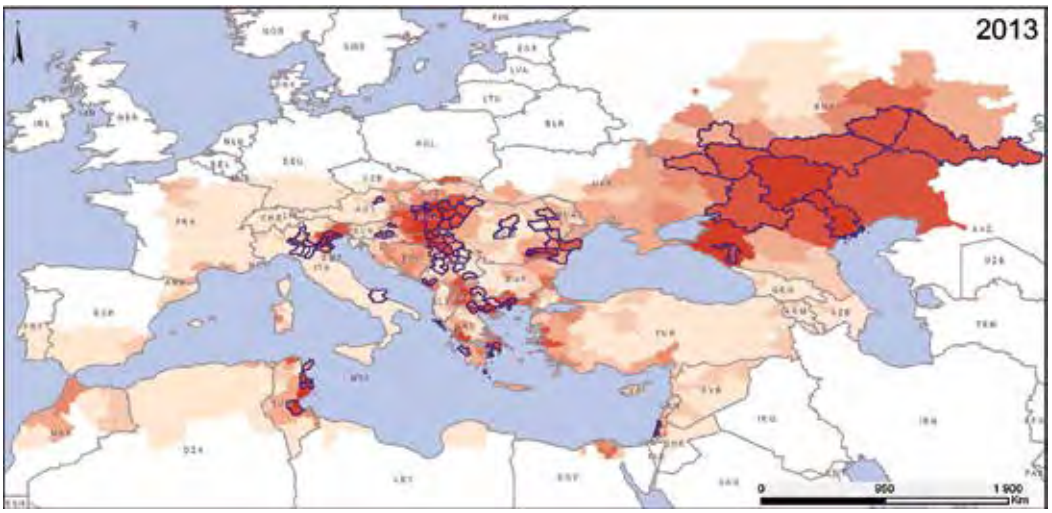
Vector-borne diseases: North Africa and central Europe face a dual threat

Climate and/or environmental change, along with trade intensification, are upsetting vector-borne disease distribution and transmission mechanisms. In addition to the effects of climate change, North Africa's and Europe's many trade links with and geographical proximity to sub-Saharan Africa mean that they are now exposed either to the introduction of new pathogens, such as Rift Valley fever (RVF), or to changes in epidemiological patterns and an increase in the number of cases, as has been the case with West Nile fever (WNF) in recent years, particularly in the Mediterranean and central Europe. In the hope of fighting these diseases, CIRAD is working (i) to reduce the impact of RVF in Africa, by modelling transmission mechanisms and suggesting surveillance plans and appropriate control methods, and ii) to develop models to forecast the spatial and temporal risks of the introduction and transmission of these diseases in North Africa and Europe, so as to target the zones to be monitored and contribute to better risk management on the part of decision-makers. ■

CONTACT Véronique Chevalier, Montpellier, France,
Animal and Integrated Risk Management



Mapping zones at risk of the occurrence of West Nile fever in Europe and the Mediterranean (in red: high risk; pink: low risk), predicted based on environmental variables for 2013, and location of West Nile fever cases reported in 2013 (districts in purple). Source: Mosquito-Borne Diseases Determinants Project (MoBoD), CIRAD, ECDC, HU

PARTNERS

Europe > European Centre for Disease Prevention and Control (ECDC)

France > Agence Nationale de Sécurité Sanitaire de l'Alimentation, de l'Environnement et du Travail (ANSES); Institut de Recherche pour le Développement (IRD); Institut Pasteur de Paris (IPP)

Israel > Haifa University (HU)

Italy > Instituto Zooprofi lattico Sperimentale dell'Umbria e delle Marche (IZSUM)

Madagascar > Institut Pasteur de Madagascar (IPM); National Centre of Applied Research and Rural Development (FOFIFA)

Morocco > Institut Agronomique Vétérinaire (IAV)

Senegal > Institut Sénégalais de Recherches Agricoles (ISRA)

South Africa > University of Pretoria (UP)

Spain > VISAVET group; Animal Health Department; Veterinary School; Complutense University of Madrid

United Kingdom > Royal Veterinary College (RVC)

Zimbabwe > University of Zimbabwe (UZ)

[FOR FURTHER INFORMATION]

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Chevalier V., Tran A. and Durand B. Predictive modeling of West Nile virus transmission risk in the Mediterranean Basin: how far from landing? *International Journal of Environmental Research and Public Health*, 2014, 11: p. 67-90

Published in 2013

AGROnews *publishes news of the agricultural research being conducted in the French overseas regions by CIRAD and its partners. Its aim is to keep CIRAD's partners, and anyone else interested, up to date with agricultural research progress.*

http://www.cirad.fr/publications-ressources/edition/agronews

AGROnews Antilles-Guyane no. 3

This issue of A*GROnews* contains a report on tick-borne diseases in the Caribbean, notably the research being done by scientists and veterinary surgeons with farmers, in the hope of improving control of the main diseases affecting farms in the zone.

AGROnews Réunion-Mayotte-Océan Indien no. 6

The AGROnews Réunion issue has been downloaded 5,275 times on http://issuu.com/cirad, 2.5 times more than the average for other issues of the journal!

Perspective 23. **Surveillance of infectious animal diseases in Southeast Asia. Promoting the multiplicity of information networks**

Muriel Figuié, Marisa Peyre, Aurélie Binot

In the light of the increasing emergence of new infectious diseases, sanitary surveillance systems would benefit from taking account of the collective initiatives being taken by farmers to manage the health of their livestock.

http://www.cirad.fr/publications-ressources/edition/perspective-policy-brief

African swine fever, a threat to pig farms

African swine fever (ASF) is the most deadly viral disease of domestic pigs and wild boars. The virus is transmitted by direct contact or by a vector, a soft tick of the genus *Ornithodoros*. In response to current climate change, CIRAD is working to understand how the environment (temperature, microbiome) affects the capacity of these ticks to reproduce and to transmit the virus. It is also trying to determine the impact of such ticks on the emergence of variants that could make any vaccine ineffective. Control methods currently centre on mass culling and drastic restrictions on trade, which are both disastrous for the pork supply chain in the regions affected (Africa, the Caucasus, Russia, and now northern Europe). Attempts to develop a vaccine (attenuated or inactivated vaccine, use of viral proteins) have so far failed. CIRAD is thus taking a novel approach, based on small nucleic acid molecules (RNAi) that inhibit virus multiplication in the host and thus stop the infection. ■

CONTACT Vincent Michaud, Montpellier, France,
Emerging and Exotic Animal Disease Control (UMR CMAEE)

Live pig market in Madagascar
© V. Porphyre/CIRAD

PARTNERS

Belgium > Centrum Voor Onderzoek in Diergeneeskunde en Agrochemie (CODA-CERVA)

France > Agence Nationale de Sécurité Sanitaire de l'Alimentation, de l'Environnement et du Travail (ANSES)

Germany > Friedrich-Loeffler-Institut – Bundesforschunginstitut für Tiergesundheit (FLI)

Italy > Instituto Zooprofi lattico Sperimentale dell'Umbria e delle Marche (IZS-UM)

Ivory Coast > Laboratoire Central Vétérinaire de Bingerville

Madagascar > Centre National de Recherche Appliquée au Développement Rural (FOFIFA)

Portugal > Universitade Técnica de Lisboa (FMV-UTL)

South Africa > Onderstepoort Veterinary Institute (OVI)

Spain > Instituto Nacional de Investigacion y Tecnologia Agraria y Alimentaria (CISA-INIA); Universidade Complutense de Madrid (UCM)

United Kingdom > Pirbright Institute (PIR); Royal Veterinary College (RVC); Wellcome Trust

European Union

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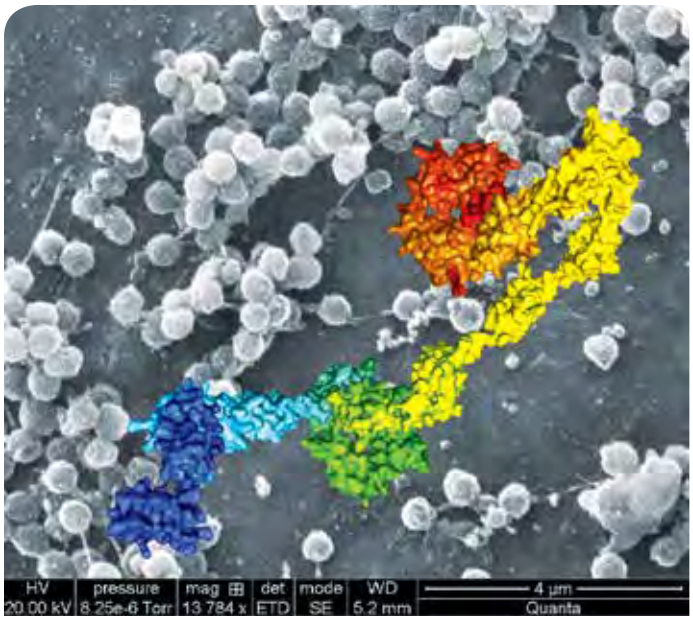
Emerging diseases: software to identify the proteins behind bacterial infections

During an infection, pathogenic bacteria prove stronger than their host, overcoming its defences and causing symptoms. To this end, they secrete proteins, or type IV effectors, within the host that enable them to exploit its cellular machinery to their own ends and overcome its immune responses. However, these virulence proteins are very hard to identify, since they do not have a specific signature. To study the mechanisms involved in these early stages of infection, a team from CIRAD recently developed software that serves to identify these proteins and analyse their genomic context. Its originality lies in its modularity, its flexibility, the quality of its predictions, and the fact that it is the only type IV effector prediction tool available on line and is the only one that can be applied to any bacterial genome. This is an important step on the way to understanding how pathogenic bacteria function and developing new treatments against animal and zoonotic bacterial pathogens. ■

CONTACT
Damien Meyer, Petit-Bourg, Guadeloupe, Emerging and Exotic Animal Disease Control (UMR CMAEE)



Artistic representation of a type IV effector secreted by an intracellular bacterium to promote pathogenicity. This illustration shows the 3D structure of a new *Ehrlichia ruminantium* effector identified by S4TE, prepared using the I-TASSER software and superimposed over a sweeping electron microscope photo of the infectious form of *Ehrlichia ruminantium* adhering to a host cell (x 13,000)
© D. Meyer/CIRAD

PARTNERS

France > Centre national de la recherche scientifique (CNRS);
Institut national de la recherche agronomique (INRA); Université des Antilles et de la Guyane

[FOR FURTHER INFORMATION]
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http://sate.cirad.fr

African animal trypanosomosis: integrated disease control means controlling tsetse flies

Vavoua trap, impregnated with deltamethrin, used for integrated control in Senegal
© CIRAD

Integrated control of African animal trypanosomosis means controlling its vectors, tsetse flies. A vast campaign, the Pan-African Tsetse and Trypanosomosis Eradication Campaign (PATTEC), was launched throughout Africa at the start of the 2000s, with a view to eradicating the disease. The campaign was organized by the African Union, and centred on an arsenal of control methods, combined within strategies tailored to individual situations, as the species responsible, their habitat, their distribution and livestock farming conditions may vary substantially from one region to another. In Senegal, Mali, Ghana and Chad, teams from CIRAD and its partners worked to identify those different situations and define the most appropriate control strategies for reducing the risks of disease transmission. Thanks to the studies conducted of tsetse fly populations and the control methods developed, it is now possible to implement control programmes tailored to each and every situation, and in some cases to eradicate the disease, not only in animals but also in man. ■

CONTACT
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Emerging and Exotic Animal Disease Control (UMR CMAEE)

[FOR FURTHER INFORMATION]

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Chad > Institut de recherche en élevage pour le développement (IRED); Institut universitaire des sciences et techniques d'Abéché (IUSTA)

France > Institut national de la recherche agronomique (INRA)

Ghana > Ministry of Food and Agriculture

International > Insect Pest Control Laboratory, a Food and Agriculture Organization of the United Nations (FAO) and International Atomic Energy Agency (IAEA) joint laboratory; African Union

Mali > Direction nationale de l'appui au monde rural

Senegal > Direction des services vétérinaires; Institut sénégalais de recherches agricoles (ISRA)

South Africa > University of Pretoria

Tanzania > Ministry of Agriculture

Desert locusts: analysing historical data to ensure better risk management

The desert locust, *Schistocerca gregaria*, is a major crop pest from Africa to India. Its ability to "gregarize" – to change its behaviour, morphology and life cycle when the number of individuals increases – makes it particularly devastating due to the formation of hopper bands and adult swarms. The only way of preventing damage is to deploy a "preventive" control strategy, consisting in seeking out and destroying gregarizing populations. Gregarization generally takes place in desert areas with occasional vegetation, and the cost of sending control teams to such areas is a limiting factor. CIRAD, in collaboration with the CLCPRO-FAO, has analysed data collected by such field teams, in Mauritania, over the past nine years. The study revealed a link between the spatial structure of vegetation and the density of individuals that triggers gregarization. By coupling those data with satellite images characterizing the vegetation, statistical models have been developed to predict the presence of locusts. Preventive control should benefit from this prediction capacity, thanks to a reduction in the zones to be surveyed and better assessment of the risk of gregarization in a given biotope. ■

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[FOR FURTHER INFORMATION]

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Group of desert locust hoppers on patches of vegetation, Mauritania, November 2013 © S. Cissé/CIRAD-CLCPRO

Whatever would mango producers do without weaver ants?!

Fruit flies cause considerable damage in West African orchards, making mangoes, citrus fruits and cashew nuts unfit for consumption. In recent years, researchers from CIRAD and the IITA have developed a range of biological control techniques against these primary and quarantine pests. In particular, they have looked at the weaver ant, a fruit fly predator, which not only eats their larvae but also emits chemical signals that serve to repel female flies.

La mouche des fruits *Bactrocera invadens* sur une mangue. © J.F. Vayssières/CIRAD

African weaver ants, *Œcophylla longinoda*, are found in tropical forests, where they form complex colonies. They often colonize mango, citrus and cashew nut plantings. These ants have, in fact, developed effective strategies for hunting in groups on the leaves of the trees, but also on the soil at the foot of the tree in which they nest, and capturing any insects they find, particularly flies. However, this is not their only mode of action. They also have a repellent effect on fruit flies: after ants have been on mangoes, fruit flies turn away from them and lay much fewer eggs. These ants supplement the arsenal of methods developed under the regional fruit fly initiative, aimed at agro-ecological pest management. ■

CONTACT

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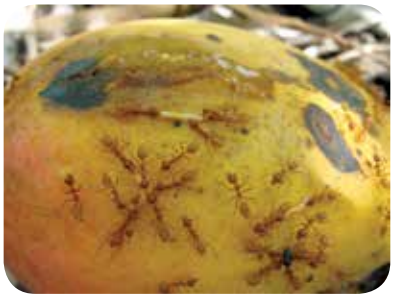
[FOR FURTHER INFORMATION]

Vayssières J.-F., Sinzogan A.A.C., Adandonon A., Van Mele P., Korie S., 2013. Ovipositional behaviour of two mango fruit fly species (Diptera, Tephritidae) in relation to *Oecophylla* cues (Hymenoptera, Formicidae) as compared to natural conditions without ant cues. *International Journal of Biological and Chemical Sciences*, 7: 447-456. Doi: 10.4314/ijbcs.v7i2.3



Weaver ants, *Œcophylla longinoda*, capturing fruit fly larvae leaving a mango © J.F. Vayssières/CIRAD

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A new genetic method to estimate pathogen dispersion

Dispersal is defined as the movement of organisms from their place of birth to their mating site. Like any other organism, pathogens disperse. However, the speed of that dispersal is often unknown. In an attempt to come up with an answer, a team from CIRAD recently developed a method based on neutral genetic markers, and applied it successfully to a major banana pathogen, *Mycosphaerella fijiensis*, which is currently spreading through every production zone at a rate of 10 km per year. The method could be particularly useful for anticipating the evolution of the capacity to cause damage of invasive or emerging organisms. Its true merit lies in the fact that it effectively represents the effect of dispersal on population adaptive dynamics in the medium term. In this respect, it is the parameter to use to predict the evolution of resistance to fungicide treatments. It is also a relevant value to integrate into models for predicting the risks of pathogens overcoming varietal resistance, depending on agricultural landscape structure. ■

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[FOR FURTHER INFORMATION]

Rieux A., Lenormand T., Carlier J., de Lapeyre de Bellaire L., Ravigné V., 2013. Using neutral cline decay to estimate contemporary dispersal: a generic tool and its application to a major crop pathogen. *Ecology Letters*. Doi: 10.1111/ele.12090

The fungus *Mycosphaerella fijiensis* causes banana black Sigatoka disease, which is currently spreading throughout every banana production zone worldwide © A. Rieux/CIRAD

Banana streak virus has let slip some of its secrets: from knowledge to agricultural application

Banana B genome (*Musa balbisiana*) shows multiple integrations of different species of the banana streak virus (BSV), a major constraint on banana breeding. Characterizing those integrations for three BSV species (BSOLV, BSGFV and BSIMV) revealed a complex structure. Each species was integrated independently and sequentially after speciation of *M. acuminata* (A genome) and *M. balbisiana*, but before the diversification of *M. balbisiana*. BSGFV and BSOLV integrations are di-allelic and present on the same chromosome (figure 1), with a single infectious allele containing the entire viral genome. Conversely, BSIMV integration is mono-allelic and on a different chromosome, with two potentially infectious alleles. Specific markers of each of the alleles and BSV species have been developed and made available to the international community (figure 2). Using those markers, both diploid BB parents devoid of infectious BSV integrations and AAB triploids without any BSV integrations have been produced. These results pave the way for the safe use of M. balbisiana in breeding programmes, and offer new prospects for breeding improved banana and plantain hybrid varieties. ■

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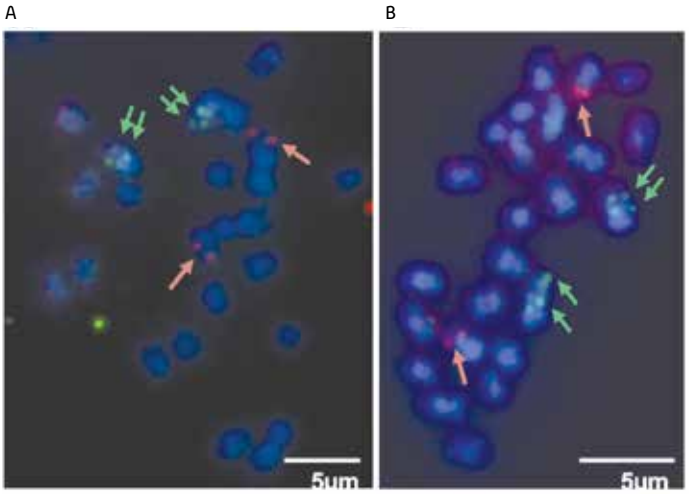
[FOR FURTHER INFORMATION]

Chabannes M., Baurens F.C., Duroy P.O., Bocs S., Vernerey M.S., Rodier-Goud M., Barbe V., Gayral P., Iskra-Caruana M.L. 2013. Three infectious viral species lying in wait in the banana genome. *Journal of Virology*, 87 (15): 8624-8637. http://dx.doi.org/10.1128/JVI.00899-13

Figure 1. Evidence of the integration of three BSV species ([BSGFV and BSOLV (green) and BSIMV (red)] in the chromosomes (blue) of banana by fluorescence in situ hybridization (FISH) © M.-S. Vernerey/CIRAD



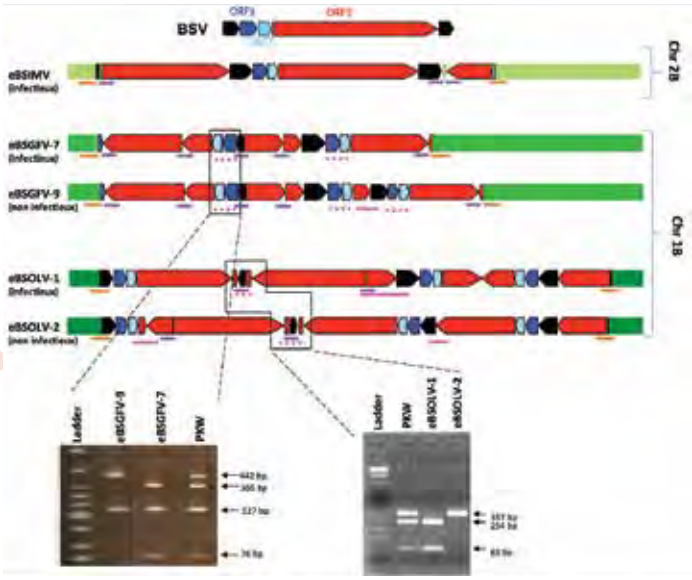


Figure 2. Position of molecular markers on BSGFV, BSOLV and BSIMV integrations in banana. The green regions represent banana genomic DNA at the dark blue, light blue, red and black regions represent ORF1, ORF2, ORF3 and the intergenic region of banana streak virus (BSV). Vital fragment orientation is shown by the arrows. Zones amplified by PCR are shown by orange, purple and pink lines, corresponding to junction markers with *Musa*, internal markers and specific alleles respectively. For the last type, there are two categories of marker: those that serve to distinguish between the two alleles by simple PCR (pink line) and those that can distinguish them after enzymatic digestion of the PCR product (dotted pink line). This enzymatic digestion results in a distinct restriction profile for each of the alleles to be differentiated.

One example is given for BSOLV integrations (right) and BSGFV integrations (left), respectively called eBSOLV and eBSGFV. The diploid banana BB *M. balbisiana* (PKW) has both alleles (infectious and non-infectious) for these eBSV. BSIMV integration is located on chromosome 2 of PKW and those of BSGFV and BSOLV on chromosome 1

6-7 November, Montpellier, France

Closing seminar of the "Emerging diseases and sanitary risks" project

The project, headed by CIRAD, set out to identify the factors that contribute to the emergence and spread of new pathogens or their vectors. Over three years, it associated animal, crop and human science researchers in a multidisciplinary debate.

The results obtained cast doubt on the dominant perceptions of emerging diseases. A study of several animal and plant pathogens showed that mutations and recombinations of the genome of such pathogens were far from exceptional, and were indeed constant. It also showed that the resulting new pathogens are not necessarily at the root of biological invasions, but emerge in a competitive environment in which new balances become established. As for the social science work conducted, it has revealed the socio-political factors that amplify our perception of potential health and economic catastrophes.

These results demonstrate the need to identify selectively the changes that may increase health risks (plant, animal and human health), rather than monitoring every new emerging pathogen indiscriminately.

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Family-run pork farm in Vietnam
© V. Porphyre/CIRAD

Transgenic crops: how can insect resistance be managed?

With the growth in the areas planted with transgenic crops that produce insecticide proteins, insect pests are becoming increasingly resistant. This was the conclusion drawn by a team of researchers from CIRAD and the University of Arizona in a review of the available scientific literature published recently on maize and cotton plants genetically modified to produce insecticidal proteins from the bacterium *Bacillus thuringiensis* (Bt). In ten years, five times as many cases of resistant insects have been recorded, but in some cases, resistance developed within two years, while in others, it still had not been detected after 15. Those differences can be put down to the means farmers use to manage the evolution of resistance. Setting up refuge zones in which insects susceptible to toxins can survive and reproduce is a key part of insect pest control. Growing second-generation transgenic plants, which produce two Bt toxins, is another possible solution. While it is inevitable that insects will adapt to Bt crops, it is possible to slow that adaptation down through integrated pest management, which combines transgenic plants and control of resistance within insect populations. ■

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Bollworm - *Helicoverpa zea* - on a cotton boll
© Brévault/CIRAD

[FOR FURTHER INFORMATION]

Tabashnik B.E., Brévault T., Carrière Y., 2013. Insect resistance to Bt crops: Lessons from the first billion acres. *Nature Biotechnology*, 31: 510-521. Doi: 10.1038/nbt.2597

Ripe cotton in India
© Brévault/CIRAD

SUPPORTING PUBLIC ACTION TOWARDS REDUCING STRUCTURAL INEQUALITY AND POVERTY

Analysing and supporting the restructuring of public action helps promote the role of agriculture in societal development. This is a research topic in its own right for CIRAD, which encompasses agricultural production, food, land tenure, land use planning, the environment and environmental and resource management, issues surrounding innovation, research and international aid, and capacity building. State action is no longer the only recognized form of regulation for alleviating inequality and poverty: the need for regulation is currently being reaffirmed by civil society, NGOs, the private sector and intergovernmental bodies, which are increasingly committing to many different types of intervention. The links between political processes and development or impoverishment trends are being studied in a wide range of situations and postures (on and within public action systems, in support and as a stakeholder).

< PUBLIC ACTION FOR DEVELOPMENT >

Role play session with representatives from seven villages in a watershed in Bhutan, with a view to facilitating participatory water management. G. Trébuil/CIRAD

© CIRAD

"We urgently need to invest in small-scale family farms"

The views of Pierre-Marie Bosc, an agro-economist with UMR MOISA (Markets, Organizations, Institutions and Stakeholders' Strategies) and coordinator of a report[1] on the constraints on investment in smallholder agriculture and the means of overcoming those constraints.

"Family farming[2] provides a living for 40% of the world's people. Investing in these types of farms – the majority of which are "small-scale" – is of strategic importance for global agricultural growth, in view of the issues it represents in terms of food security and poverty alleviation.

In our report, we identify three obstacles to investment capacity for smallholders: lack of access to capital; unfavourable markets, notably due to price volatility; and lastly, a lack of institutions, organizations and collective action that hampers access to investment.

We feel it is vital to define visions that are shared by policy-makers, producers' organizations and the private sector as regards strategies for investing in small-scale farming. That investment obviously relates to improving productivity, but also to making such farms more resilient thanks to agro-ecology and developing production activities intended to feed the farmer's household. This means investing on a landscape scale to improve water supplies and resource management, but also in infrastructures that would improve market access for smallholders. Investment in the non-agricultural sector is therefore also necessary, particularly since rural households bolster their financial situation by taking non-agricultural jobs.

We stress the need to coordinate investment between various sectors: the environment, development of small and medium-sized enterprises, and access to public services (social protection, health and education services). In Brazil, for instance, the *Fome Zéro* (zero hunger) programme and the food supply programme (family farms supply school canteens, hospitals and prisons) have taken on board social concerns, and provide rural households with direct aid.

The recommendations made in the report can be used by producers' organizations in international talks. We are keen to encourage governments to introduce new, wider-ranging policies that are not limited to the agricultural sector alone." ■

Family of Fula crop-livestock farmers in Benin © E. Malézieux/CIRAD

[FOR FURTHER INFORMATION]
Interview with Pierre-Marie Bosc on CIRAD website:
http://www.cirad.fr/en/news/all-news-items/articles/2013/questions-a/p.-m.-bosc

1. Report by the High-Level Panel of Experts (HLPE) on Food Security and Nutrition, published in June 2013 and produced at the request of the Committee on World Food Security (CFS) by P.M. Bosc, J. Berdegué, M. Goïta, J. D. Van der Ploeg, K. Sekine and L. Zhang
http://www.fao.org/3/a-i2953e.pdf

2. 2014 has been declared International Year of Family Farming by the United Nations

GlobalGap certification: what impact has it had on the lychee supply chain in Madagascar?

Although obtaining certification is both difficult and costly, it looks like a good opportunity for smallholders. Is this really the case? GlobalGap, one of the most commonly used private standards in the fresh product trade worldwide, was introduced in the Madagascan lychee supply chain in the mid-2000s. For lychees, GlobalGap requirements mainly focus on postharvest treatments such as sulphur dusting, which is essential to preserve lychees during shipment to Europe. After an enthusiastic reception to begin with, certification fell out of favour, and by 2009, only a hundred or so producers were still certified. A survey by a team from CIRAD and INRA has shown that while certification enables the producers who are certified to sell more lychees and for a higher price, it has a very limited effect on the supply chain as a whole, since it concerns only a very small, highly specific group of producers. The situation could change if the Madagascan supply chain were to find itself forced to take steps to guarantee that its products meet European standards. This could result in a segmented market with certified exporters supplying the European market, and non-certified exporters shipping their lychees to less demanding markets. ■

Madagascan lychees © E. Malézieux/CIRAD

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This study was conducted within the framework of the NTM-Impact project, funded by the European Commission.

[FOR FURTHER INFORMATION]

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Social LCA: a study method working for the future of supply chains

"From cradle to grave" is the catchy slogan for LCA (Life Cycle Assessment), and it sums up the concept well: the assessment – from start to finish – of the environmental impacts of a supply chain that generates either products or services. The aim of social LCA is to pinpoint the effects of a change in the activities of a value chain on the wellbeing of individuals and of the society in which they live. Social LCA fills the gaps in the approach used previously to study the social repercussions of choices made regarding investment, setting up factories, social expenditure, income distribution, etc: CSR (Corporate Social Responsibility). It anticipates the consequences for the environment and the social and economic repercussions of public and private decisions. Researchers from several French organizations, including CIRAD, looked at this new assessment method, particularly its use to study the main international agricultural commodity supply chains. They published a book in 2013 on the results of their work and their shared vision of social LCA. ■

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[FOR FURTHER INFORMATION] Macombe C. (coord.), 2013. *Social LCAs, Socio-economic effects in value chains.* Montpellier, CIRAD, FruiTrop, Thema collection, 172 pp. (English and French versions available)

The end of the working day for workers in a banana plantation in Ghana © D. Lœillet/CIRAD

PPZS: from agro-ecology to public policy

Pastoral livestock systems are still a major way of life and production system in the arid zones of Africa.

Since 2001, they have also been the study topic for a scientific interest group, which is now a research and training platform in partnership.

D. R.

Alioune Fall is Director General of the Institut sénégalais de recherches agricoles (ISRA) and a specialist in production system modelling

Tell us a bit about the Pôle pastoral zones sèches (PPZS)...

Alioune Fall: The PPZS is a scientific interest group based at ISRA's national livestock production and veterinary research laboratory in Dakar. It aims to improve management of pastoral resources and the economic performance of pastoral livestock production, to benefit rural development.

One of the challenges for the PPZS is also to inform political and economic decision-making...

A.F.: Indeed. The PPZS has, for instance, looked at how pastoralism could improve rural land management in Senegal. The Minister of Livestock has taken heed of our recommendations, notably for the land occupation and use plan.

What are the challenges for the future?

A.F.: In 2014, several research projects will be coming to an end. There will be a lot of results to publicize. Moreover, I think we need to talk more about our training operations, since the PPZS is capable of supervising several PhD students. This vital role is maybe not sufficiently recognized by PhD schools.

What are the advantages of being part of this structure?

A.F.: Polling resources, knowledge and disciplines is an opportunity. Furthermore, the PPZS facilitates administrative procedures and lightens the constraints on researchers as regards resource management. However, the PPZS needs to find its own sources of funding if it is to ensure its sustainability. ■

PARTNERS

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http://ppzs.org/

http://www.isra.sn/

A New Emerging Rural World in Africa

The atlas *A New Emerging Rural World,* published by CIRAD and NEPAD, takes stock of rural restructuring in North and sub-Saharan Africa. It relates data on demographics, population, urbanization and resource use with spatial and economic dynamics, both on a continental scale and through several regional examples. It is a totally original tool that is intended to fuel the debate on the main regional and continental development issues and fits in with NEPAD's Rural Futures programme. The programme plans to support territorial dynamics and structural change for sustainable development of the continent. The atlas provides a reference situation for future work that could serve to fine-tune analyses on a regional and thematic level and identify the main changes. It will be supplemented and updated regularly. The atlas was widely praised by the participants in the 1st Africa Rural Development Forum organized in Benin in early May 2013. It was subsequently presented at the ceremonies to mark the fiftieth anniversary of the African Union and given to all the African Heads of State at the African Union Summit in Addis Ababa.

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Africa > New partnership for Africa's Development (NEPAD); African Union

France > Agence française de développement (AFD)

Losch B., Magrin G., Imbernon J. (dir.), 2013. *A new emerging rural world: an overview of rural change in Africa.* Montpellier, CIRAD (English and French versions on www.cirad.fr)

South-South cooperation: truths and misconceptions

A CIRAD-AFD study[1] deciphered the way in which Chinese and Brazilian players behave in the agricultural sector in Africa. This research, which was based on the reality in the field, refuted certain misconceptions. A glimpse of the study with Jean-Jacques Gabas, an economist at CIRAD[2] who was one of its authors.

© CIRAD

How can you sum up the way in which Chinese and Brazilian players act in the agricultural sector in Africa?

Jean-Jacques Gabas: As regards China, the rationale is changing and moving towards public-private sector partnerships. Agricultural demonstration centres, for instance, are funded through grants from the Chinese government for the first three years, to enable the completion of buildings and infrastructures and agricultural extension work with local farmers. From then on, private companies take over and convert the centres into agricultural production units for the local market. Furthermore, China considers that food security can be guaranteed in Africa by increasing food crop supplies, and it pays little attention to how agricultural markets operate.

Brazil's role in Africa is very different. It centres on transferring its own agricultural development model, in which family farming and agribusiness co-exist.

Your study refutes certain misconceptions. Which ones?

J.J.G.: You often hear, particularly in the media, that the Chinese grab land in Africa, which they farm to satisfy their own requirements, or that they are major donors in the agricultural sector. Both these ideas are wrong. The USA, the EU, the Gulf states and India are the biggest investors in Africa, just as the OECD member countries are currently providing much more aid than China. As for the idea of "agricultural decentralization" from China to Africa, there is nothing in the field to prove this. Apart from cotton, the goods produced by Chinese firms in Africa are systematically sent to local or regional markets. We are going to pursue our analysis of Chinese agricultural investment in Africa through a new programme we are conducting with Tsinghua University in Peking, funded by the AFD and CIRAD.

Does this research not cast doubt on our own aid practices in France?

J.J.G.: Of course, if this research programme is intended to establish the facts and understand the strategies adopted by Chinese players, it should also provide an opportunity to look at the aid models put forward by the traditional donors on the OECD Development Assistance Committee, in view of the demographic and economic issues sub-Saharan Africa is facing. ■

1. *Coopérations Sud-Sud et nouveaux acteurs de l'aide au développement agricole en Afrique de l'Ouest et australe. Le cas de la Chine et du Brésil*. J.-J. Gabas, F. Goulet, Cl. Arnaud, J. Duran. CIRAD-AFD, À Savoir collection no. 21, 2013

2. With the Actors, Resources and Territories in Development Joint Research Unit (UMR ART-DEV)

Measuring development: how to combine science and policy

Village of Yenga, in southeastern Cameroon
© C. Doumenge/CIRAD

Measuring development raises numerous issues. Some are technical, and concern the methodological aspects of data production, the choice of indicators, and possible bias. Others are more policy-related, and concern how those data are used. Placing measurement of development in historical perspective serves to demonstrate the link between the emergence of measurements, on the one hand, and development paradigms and representations, on the other. Indicators are not used at random; they fit into dominant schools of though and are at the service of development and aid policies. Transparency of how measurements are produced, an essential condition for the democratic functioning of society, is far from a given: public- and private-sector development players are tempted to use measurements to show themselves in a positive light. Moreover, the choice of indicators has a substantial influence on policies and how they are assessed. That influence results in many forms of bias that need to be identified so as not to leave any room for randomness in the guise of technical objectivity. Assessment processes themselves are currently the subject of talks between development players, including cases in which dominant players impose a type of assessment process that reinforces their domination, thanks to their mastery of the relevant knowledge. ■

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[FOR FURTHER INFORMATION]

Gabas J.J., Ribier V., 2013. Les déterminants politiques de la mesure de l'aide au développement. *Revue Tiers Monde*, 213: 33-50. Doi: 10.3917/rtm.213.0033

Gabas J.J., Ribier V., Vernières M., 2013. La mesure du développement: comment science et politique se conjuguent. *Revue Tiers Monde*, 213: 7-22. Doi: 10.3917/rtm.213.0007

Agriculture can also mitigate climate change

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The point of view of Emmanuel Torquebiau, CIRAD Climate Change Correspondent

It is known as climate-smart agriculture. It simultaneously ensures food security, adaptation to climate change and mitigation of greenhouse gas emissions.

Most people's first idea was to mitigate climate change. Then we had to resign ourselves to adapting to it. Nowadays, in the agricultural sector, the two operations are inextricably linked. Climate-smart agriculture reconciles three objectives: food security, adaptation, and mitigation of greenhouse gas (GHG) emissions. CIRAD has been involved in the debate on this new concept, and in 2013, it co-organized[1] an international scientific conference on the topic at the University of California, Davis, in 2013.

Climate-smart agriculture associates scientific innovation and public policy. Combining adaptation and mitigation means using novel practices such as intercropping, permanent soil cover, mosaic landscapes, etc. But it also calls for appropriate legislation that encourages farmers to innovate, for instance tax incentive, payments for ecosystem services, or labelling mechanisms.

At the Davis conference, the need for a "Science for Action" research programme emerged, with three objectives: working on several scales, with various stakeholders, and linking up with other global initiatives in this field[2]. In particular, CIRAD called for the introduction of a "science/policy" process capable of supporting the emergence of an authentic community of thought, at the interface between science and policy-making. CIRAD is also due to organize the next Global Science Conference on Climate-Smart Agriculture in Montpellier in March 2015, in partnership with INRA, the IRD, the CGIAR's CCAFS programme, the University of California, Davis, and the University of Wageningen, with a view to taking stock of the latest scientific progress on the issue and contributing to COP 21 of the United Nations Framework Convention on Climate Change, to be held in Paris in December 2015. This event will also be setting out to pinpoint the priorities as regards the introduction of promising technologies, practices and approaches in developing countries, and will ensure that the views of specialists from those countries are taken into account. The idea is for the next global scientific conference on climate-smart agriculture to be held in a developing country. ■

1. With the University of California, Davis, the World Bank, the FAO, the University of Wageningen, and the Dutch Ministry of Economic Affairs, Agriculture and Innovation

2. CGIAR Research Programme on Climate Change, Agriculture and Food Security, European Commission FACCE JPI, FAO knowledge platform on climate-smart agriculture, December 2013 conference in South Africa on public policy and climate-smart agriculture, United Nations post-2015 development agenda, Global Research Alliance on Agricultural Greenhouse Gases, FAO Tropical Agricultural Platform

Farm on the banks of the Boufedrane wadi, Meknès, Morocco © P. Dugué/CIRAD

SUPPORTING SOCIETIES IN MANAGING TERRITORIES SUSTAINABLY

In the face of global change, multifunctionality is a necessity for agriculture: we need to "produce more, in a better way, or something different". This makes governance of rural areas extremely complex. Increased competition, if not conflict, over managing resources and the environment and satisfying the demands of an ever-growing number of stakeholders is now posing a threat to agro-ecosystems, and particularly to the world's poorest people. To help societies manage the living world sustainably, research is committed to play a role in multi-scale engineering of territorial change. One particular aim is to reinforce the regulatory processes necessitated by ecological, health, economic, social and political uncertainty, by coordinating collective action and public action.

< SOCIETIES, NATURE AND TERRITORIES >

Date harvesting in the Fatnassa oasis, southern Tunisia © O. Hébrard

Forest plantations: mixing species to improve soil exploration by the roots

One way to intensify wood production while preserving the environment is to set up mixed plantations, combining species selected for the characteristics of their wood, and legume crops. By fixing atmospheric nitrogen, the latter reduce the need for nitrogen fertilizers. A research project coordinated by CIRAD assessed the potential of such forest plantations and studied how biodiversity influences underground processes such as facilitation and competition between species. The researchers compared the distribution of fine roots where they compared distribution in eucalyptus and acacia monocultures and in mixed-species plantings with 50% eucalyptus trees and 50% acacia trees, at an experimental station in Brazil. They observed that in the mixed-species stands, total fine root biomass was around 27% higher than in monocultures, due to the eucalyptus trees, whose fine root biomass increased by 72% on average for each tree planted. These studies will help to explain how natural resources are shared within mixed-species tropical forests and to identify the most suitable species and silvicultural practices for these tropical plantations. ■

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Brazil > Universidade de São Paulo; Universidade Estadual de São Paulo

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[FOR FURTHER INFORMATION]

Laclau J.P., Nouvellon Y., Reine C., De Moraes Gonçalves J.L., Krusche A.V., Jourdan C., Le Maire G., Bouillet J.P., 2013. Mixing Eucalyptus and Acacia trees leads to fine root over-yielding and vertical segregation between species. *Oecologia*, 172: 903-913. Doi: 10.1007/s00442-012-2526-2

Nodulated *Acacia mangium* roots in the ANR Intens&fix project experiment, Brazil © J.-P. Laclau/Cirad

Managing water resources in the oases of Nefzawa, Tunisia

In recent decades, the Nefzawa region in southern Tunisia has become specialized in growing date palms, resulting in over-exploitation of groundwater resources. A multidisciplinary research programme aimed at introducing sustainable management methods that will both preserve resources and create the conditions required for the region's economic and social development is being implemented in the Fatnassa oasis, within the framework of the SIRMA network. Extending palm plantations is exacerbating clogging of the irrigation network. These effects are compounded by poor mastery of irrigation on the part of farmers, making the distance travelled by the water longer and adversely affecting date production. These malfunctions are the result of local economic and social conditions, which push farmers towards extensive plantation management strategies. Ensuring better water productivity and generating added value within the local economy to keep younger generations of farmers in the region will inevitably mean improving the quality of the dates produced and how they are marketed, by introducing new forms of coordination and developing new markets. ■

CONTACT

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France > Institut de recherche pour le développement (IRD)

Tunisia > Institut national de recherche en génie rural, eaux et forêts (INRGREF)

[FOR FURTHER INFORMATION]

Mekki I., Jacob F., Marlet S., Ghazouani W., 2013. Management of groundwater resources in relation to oasis sustainability: The case of the Nefzawa region in Tunisia. *Journal of Environmental Management*, 121: 142-151. Doi: 10.1016/j.jenvman.2013.02.041

http://www.rcp-sirma.org/

The Fatnassa oasis, in southern Tunisia, is threatened by salinity
© S. Marlet/CIRAD

"It is vital to secure the land tenure rights of crop and animal farmers"

Research is continuing **to study the large-scale land grabbing phenomenon**, to wit the publication of a special issue of the journal *Cahiers Agricultures*. A chance to take stock with Perrine Burnod, co-coordinator of the issue and economist at CIRAD.

A few years after the media frenzy, how have large-scale land grabbing practices changed in southern countries?

Perrine Burnod: Since 2009, depending on the country concerned, between 30 and 70% of planned investments have not actually been made. The main reasons are as much a lack of realistic estimates of costs, returns on investment and agricultural risks as a lack of foresight and a failure to take account of local social and political reactions. However, the trend is continuing. The first projects are under way in the field and others are planned.

Is it possible to reconcile private agricultural investment and family farming?

P.B.: Yes, because private investment does not necessarily mean control over land tenure. In this respect, there is currently renewed interest in production models based on contract farming. Such models involve arrangements between a firm and farmers, with the former buying what the latter produce. If past experience is anything to go by, contract farming systems have a positive impact on a local level. However, over and above contract farming, the issue is also identifying and fostering complementarity, not only between private operators and family farms, but also between activity sectors such as production, marketing and processing.

Private investment in the agricultural sector can take many forms. But in any case, it seems to be essential to secure land tenure rights for rural populations...

P.B.: Indeed. Whatever the policy adopted in the countries concerned to promote private investment, it is vital to secure the land tenure rights of crop and animal farmers. In part, this means setting up a range of mechanisms to ensure legal recognition of those rights and the diversity of bodies in charge of managing land tenure on a local level. However, above all, it calls for a commitment on the part of political leaders, increased awareness among private firms, the inclusion of rural communities in land management, and support for this from civil society, research and donors. Legislative tools are important, but will only be effective if they are combined with mechanisms to ensure transparency of information, support stakeholders' negotiating capacity on a local level au local, provide incentives, impose checks on the activities of private firms and public decision-makers, and promote debate. ■

PARTNERS

Land Matrix interface

France > Pôle de recherche sur le foncier rural dans les pays du sud

Madagascar > Observatoire du Foncier

[FOR FURTHER INFORMATION]

Appropriations foncières et modèles agricoles. *Cahiers Agricultures* special issue. Editorial co-ordination: Perrine Burnod and Jean-Philippe Tonneau. Volume 22, No. 1, January-February 2013

Agricultural recycling of waste: what are the risks for market garden crops?

Organic waste is increasingly being used as a fertilizer and amendment on market garden crops. It improves soil physical properties, reduces runoff and erosion and boosts the amount of organic carbon and other major elements, while reducing mineral fertilizer use and increasing biomass and microbial activity. However, it can also have an adverse effect on crops and the environment, due to the presence of potentially toxic substances: heavy metals. A team from CIRAD and CEREGE (INTERFAST) analysed a range of types of organic waste from Senegal, Madagascar and France, to determine their toxic element composition and the origin of those contaminants. The researchers distinguished between three groups of products, not on the basis of their geographical origin, but on the basis of the origin of the contaminants found. They also revealed the asymmetric distribution of heavy metal concentrations in the waste, and a very wide range of concentrations for a given element. Lastly, the highest heavy metal concentrations, particularly lead, were found in the screened dump waste from Madagascar and Senegal. ■

CONTACT

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Recycling and Risk

PARTNERS **France >** Interface et transferts (Interfast) team, CEREGE (joint research unit: University of Aix-Marseille, CNRS, IRD)

[FOR FURTHER INFORMATION] Tella M., Doelsch E., Letourmy P., Chataing S., Cuoq F., Bravin M., Saint Macary H., 2013. Investigation of potentially toxic heavy metals in different organic wastes used to fertilize market garden crops. *Waste Management*, 33: 184-192. Doi: 10.1016/j.wasman.2012.07.021

Sewage farm sludge drying pond, Pikine, Dakar region, Senegal © E. Doelsch/CIRAD

What impact will climate change have on cotton yields in Cameroon?

Cotton is the main cash crop in northern Cameroon, where its productivity is largely conditioned by the climate. What impact will climate change have on yields? Researchers from CIRAD, IRD and IRAD combined experiments, crop models and climate projections to simulate the evolution of yields over the next 50 years. Their paradoxical conclusion is that cotton yields are likely to increase thanks to the fertilizing effect of elevated carbon dioxide levels, especially in conjunction with conservation agriculture techniques. Although the simulations do predict an increase in yields, this largely depends on the cropping system adopted: yields increase particularly for no-till systems with cover crops, probably because of a reduction in water losses thanks to ground cover. In response to climate change, it will be necessary either to delay planting, if the genetic material used still has the same phenology, or to modify the phenology of future cultivars by delaying the onset of flowering and by lengthening the seed filling stage. In each case, these changes must be anticipated by adopting innovative cropping systems and adapting cultivation techniques. ■

CONTACT

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Annual Cropping System

PARTNERS

Cameroon > Institut de recherche agricole pour le développement (IRAD)

France > Institut de recherche pour le développement (IRD)

[FOR FURTHER INFORMATION]

Gérardeaux E., Sultan B., Palaï O., Guiziou C., Oettli P., Naudin K., 2013. Positive effect of climate change on cotton in 2050 by CO_2 enrichment and conservation agriculture in Cameroon. *Agronomy for Sustainable Development*, 33: 485-495. Doi: 10.1007/s13593-012-0119-4

Visit of an on-farm experimental system with cover crops by a group of farmers from Lara village, Far North province, Cameroon © K. Naudin/CIRAD

Published in 2013

L'agroécologie en Argentine et en France – Regards croisés

Under the direction of Frédéric Goulet, Daniele Magda, Nathalie Girard, Valeria Hernandez. Editions L'Harmattan 2012

What exactly is meant by agro-ecology? Who are the players defending, developing and implementing it? And above all, while agro-ecology is now being talked about on every continent and within international organizations, is it always in the same terms, and is it prompting the same debates the world over? This book centres on these questions, with reference to the situation in two leading agricultural countries, France and Argentina, where agro-ecology has recently seen significant developments.

Baobabs étranges, mystérieux et complexes

An interactive web document about baobabs, a fascinating tree found in Madagascar

Baobabs seem to grow upside-down, with their roots in the air. People the world over are fascinated by them. In Madagascar, it is at the heart of the country's heritage. This web document, produced by Madamovie in partnership with CIRAD, FOFIFA and the University of Antananarivo, provides comprehensive information about the history of baobabs, current research, uses and traditions, and distribution worldwide.

http://madagascar.cirad.fr/FichiersComplementaires/baobab.html

Bois et forêts des tropiques

At the interface between research and development, the journal Bois et forêts des tropiques, *which is published by CIRAD, is entirely devoted to forestry science and technology in warm regions. It is a quarterly, covering news from numerous scientific and technical fields. Articles are published in English, French or Spanish.*

No. 314 Special issue centring on tropical silviculture, following on from the IUFRO 2011 conference

No. 315 Special issue centring on tropical silviculture, following on from the IUFRO 2011 conference, with particular emphasis on landscapes, community forests and development

No. 316 Issue on the topic of carbon, climate change and environmental services

Perspective 20. Territorial development. Quinoa, a catalyst for innovation

Didier Bazile

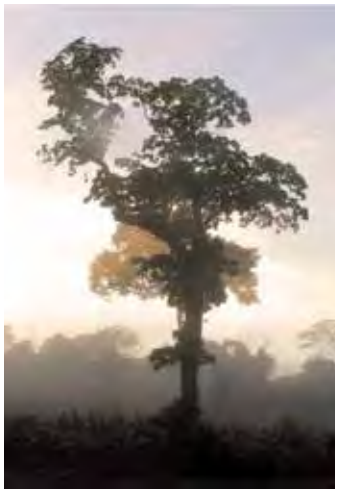
The International Year of Quinoa (IYQ) in 2013 celebrated this Andean plant for its potential contribution to the fight against hunger and poverty. Didier Bazile shows that the quinoa supply chain can have a far from negligible effect on territorial development, above and beyond its potential to alleviate hunger and poverty.

Perspective 22. Lower deforestation rates in the Brazilian Amazon - Supporting farm forestry

Plinio Sist, Lucas Mazzei, Philippe Sablayrolles

In a little under ten years, deforestation in the Brazilian Amazon has decreased by 80%. As the 2013 statistics for deforestation are due to be published, CIRAD researchers and their partners examine this steady reduction.

http://www.cirad.fr/en/publications-resources/publishing/perspective-policy-brief



Majestic Brazil nut tree *(Bertholettia excelsa)* in the middle of a rangeland
© P. Sist/CIRAD

Madagascar, two long-lasting platforms in partnership

Names: Farming System Sustainability in the Highlands (SPAD), and Forests and Biodiversity in Madagascar (F&B).

Age: ten years.

Future: another ten years, thanks to recently renewed partnership agreements

What are the aims of the two platforms in which FOFIFA has been a partner since the beginning*?

Jacqueline Rakotoarisoa: Farming System Sustainability in the Highlands (SPAD) is centring its research on the sustainability of upland systems and the development of upland rice varieties suited to the conditions at altitude in Madagascar. For instance, we have developed 13 rice varieties suited to high-altitude areas that are resistant to rice blast disease. This means rice can now be grown up to 1800 m above sea level, whereas that was impossible twenty years ago. Forests and Biodiversity (F&B), for its part, is attempting to reconcile biodiversity conservation and improved living conditions for local people, notably by making use of forest resources.

What are the advantages of being part of a platform in partnership?

J.R.: As far as FOFIFA is concerned, we see it as an asset and a complete success! These partnerships have help us build our research capacity, acquire equipment and improve training operations. I myself studied for my thesis within the SPAD platform. Moreover, the visibility offered by these platforms in partnership makes it easier for us to respond to invitations to tender.

What are the challenges for the future?

J.R.: We have another ten years ahead of us to tackle a range of challenges. For instance, optimizing clove-based agroforestry systems, as cloves and clove essential oil are among Madagascar's leading exports. Another major project is integrating crop and animal farming, which when combined with agro-ecological methods should help us develop more sustainable farming systems to benefit smallholders in Madagascar. ■

© P. Danthu/CIRAD

Jacqueline Rakotoarisoa is Scientific Director of FOFIFA (National Centre of Applied Research and Rural Development) and an agronomist specializing in rice growing

PARTNERS

F&B

France > CNRS; IRD

Madagascar > University of Antananarivo; FOFIFA; NGOs (Partage, Fanamby); Madagascar National Parks; State services

http://www.forets-biodiv.org/

SPAD

France > IRD

Madagascar > FIFAMANOR (Research Department, Animal Husbandry Department); FOFIFA (Antsirabe regional research station [SRRA], Lake Alaotra agricultural research centre [CALA], Rice Research Department [DRR], Zootechnic and Veterinary Research Department [DRZV]); University of Antananarivo (Ecole supérieure des sciences agronomiques [ESSA], Radio Isotopes Laboratory [LRI], Science Faculty)

* With the University of Antananarivo and CIRAD

29-31 May, Nairobi, Kenya

International Workshop on Agricultural Innovation Systems in Africa

The workshop, co-organized with the CGIAR, Australian aid services, the Prolinnova network and KARI, was attended by almost a hundred people, selected for their experience and their ability to represent a range of key players in innovation in Africa, in relation with the Eastern Africa Farmer Innovation Fair. The participants were able to meet some fifty farmer-innovators from four countries. CIRAD, the main organizer via the JOLISAA project, confirms the relevance of a multi-stakeholder approach in the case of innovation processes, whether to understand them better or to support them. There are new prospects for research and collaboration on topics such as innovation platforms, and also on the co-transmission of targeted messages about innovation to institutional and political decision-makers.

http://aisa2013.wikispaces.com/ais+workshop

http://www.jolisaa.net/

SIPSA: an information system for monitoring pastoral dynamics in the Sahel

In the Sahel, pastoralism is faced with many economic challenges, notably linked to the marginalization of pastoral populations within local governance bodies and to increased competition for access to resources. Herdsmen and politicians lack information and specific indicators on the issues and the viability of this type of production system It was in response to these challenges that CIRAD and its partners in the region developed the *système d'information sur le pastoralisme au Sahel* (SIPSA). The system is a decision support tool for anticipating, managing and monitoring changes in pastoralism and its interactions with the environment. It provides relevant, up-to-date information on the state of and trends in Sahelian pastoral systems, and serves to develop information products. The *Atlas des évolutions des systèmes pastoraux au Sahel 1970-2012,* published by CIRAD and the FAO, compiles the specific information gathered within the SIPSA and supplements it with graphic representations, enabling a clearer understanding of pastoral systems and their spatiotemporal dynamics. It serves as a reference for current research and development programmes on pastoralism in the Sahel. ■

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France > Ministry of Foreign Affairs

International > Comité permanent inter-États de lutte contre la sécheresse dans le Sahel (CILSS); Food and Agriculture Organization of the United Nations (FAO); Pôle pastoralisme et zones sèches (PPZS)

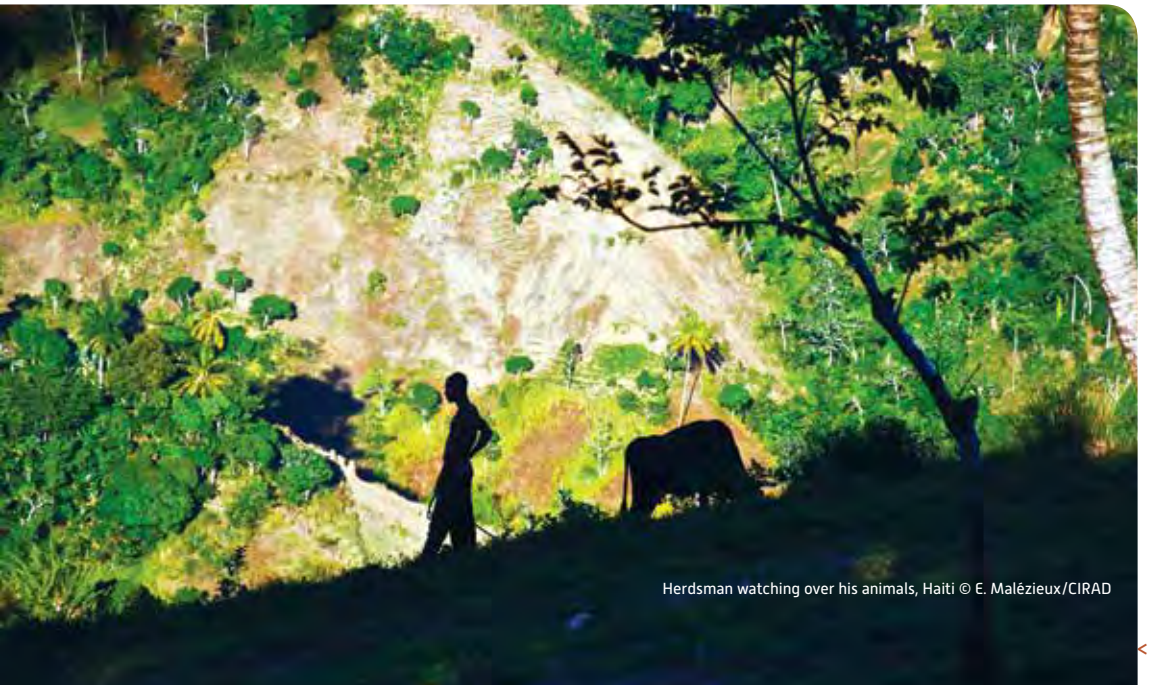
[FOR FURTHER INFORMATION]

Touré I., Ickowicz A., Wane A., Garba I., Gerber P., 2012. *Système d'information sur le pastoralisme au Sahel: Atlas des évolutions des systèmes pastoraux au Sahel*, 1970-2012. FAO, CIRAD

An original way of transporting camels, between Tahaou and Tabalawkh, Niger © I. Touré/CIRAD

Acting at times of uncertainty in agriculture

Going beyond analyses in terms of risks and insurance, coming up with new approaches to report on the uncertain, the complex, the long term and the capacities of systems to resist, change and learn from their changing environment... this is what researchers from CIRAD and INRA are suggesting in a new synthesis, the fruit of a series of debates on action at times of uncertainty, in both North and South. For the authors, writing the book meant considering the unpredictable, investigating how it triggers ways of «acting» in the agricultural world that enable a break with the stalemate of agricultural routines in recent decades, taking new directions in the real environment and an unstable society, and seizing medium- and long-term opportunities. The aim was also to pinpoint both the similarities and the differences between farming worlds and overcome the tendency to analyse them separately, considering that the uncertainty in the North is more technological, while that in the South is climatic, political and social. All over the world, these choices fit into individual and collective strategies: the relationship with change and the protective measures implemented in response to uncertainty are social constructs. ■



Herdsman watching over his animals, Haiti © E. Malézieux/CIRAD

CONTACT
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PARTNER **France >** Institut national de la recherche agronomique (INRA)

[FOR FURTHER INFORMATION]

Ancey V., Avelange I., Dedieu B. (dir.), 2013. *Agir en situation d'incertitude en agriculture: regards pluridisciplinaires au Nord et au Sud*. Peter Lang.

Rurality and sustainable development in New Caledonia

The Poindimié workshop enabled all the stakeholders on the island to discuss the sustainable development issues in New Caledonia © D.R.

How does sustainable development help define the changes in and challenges for the rural world in New Caledonia? Are we all talking about the same thing when we involve sustainable development in public action or research? In New Caledonia, does it fit in with the watchwords of political agreements on negotiated decolonization or suggest alternative visions of development? Above and beyond injunctions and political rhetoric, has it resulted in concrete actions and impacts for those living in rural areas? The Poindimié workshop, organized on the initiative of the IAC with support from CIRAD, enabled the island's various players to discuss these questions and attempt to come up with answers, by sharing and comparing their views, ambitions and fears for the rural world in New Caledonia. The debates held during the workshop concerned the situation in New Caledonia, but placed in the context of rural development in the South Pacific, and the theoretical controversies surrounding sustainability. A book, *Ruralité et développement durable en Nouvelle-Calédonie,* is now available that summarizes the workshop and puts the exchanges and debates it prompted into perspective. ■

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[FOR FURTHER INFORMATION]

Sourisseau J.M., Bouard S., Pestana G., 2013. *Ruralité et développement durable en Nouvelle-Calédonie: synthèse des ateliers de Poindimié et perspectives*. Païta, IAC

Voyage en Afrique rentière, une lecture géographique des trajectoires du développement

This book, a «trip through 'rentier' Africa» uses the concept of rent to look at development pathways in Africa and the possibilities for change. It is based on research conducted by CIRAD and its partners in West and central Africa, and attempts to understand how rentier systems have contributed to territorial organization and dynamics, and to the spatial strategies of the various stakeholders. The book looks at the possibilities for African countries of leaving the historic pathway marked by extroversion backed up by rentier States. The rentier analysis grid certainly highlights the ambiguities of decentralization processes, which promise to catalyse local energies but tend to reproduce many of the malfunctions of central government: extraversion, dependence, clientelism and, on a geographical level, fragmentation of public action. The author goes beyond both Afro-pessimistic and Afro-optimistic stances, which are equally simplistic, and stresses how the current context of relations between Africa and the global system potentially favours in-depth changes, but that those changes will depend on the power struggles under way between the defenders of the established order and those in favour of change. ■

CONTACT Géraud Magrin, Paris, France,
Spatial Information and Analysis for Territories and Ecosystems (UMR TETIS)

[FOR FURTHER INFORMATION]

Magrin G., 2013. *Voyage en Afrique rentière: une lecture géographique des trajectoires du développement*. Paris, Publications de la Sorbonne, 424 pp.

Ouaga 2000, or post-adjustment urbanism (December 2006): this smart area illustrates the circulation of money in Africa in the 2000s and the worsening of inequalities in favour of the political elite and of migrants who had succeeded © G. Magrin/CIRAD

Making things possible. Jacques Weber, itinéraire d'un économiste passe-frontières

Editorial coordination: M. Bouamrane, M. Antona, R. Barbault, M.-Ch. Cormier-Salem. Editions Quae, 2013

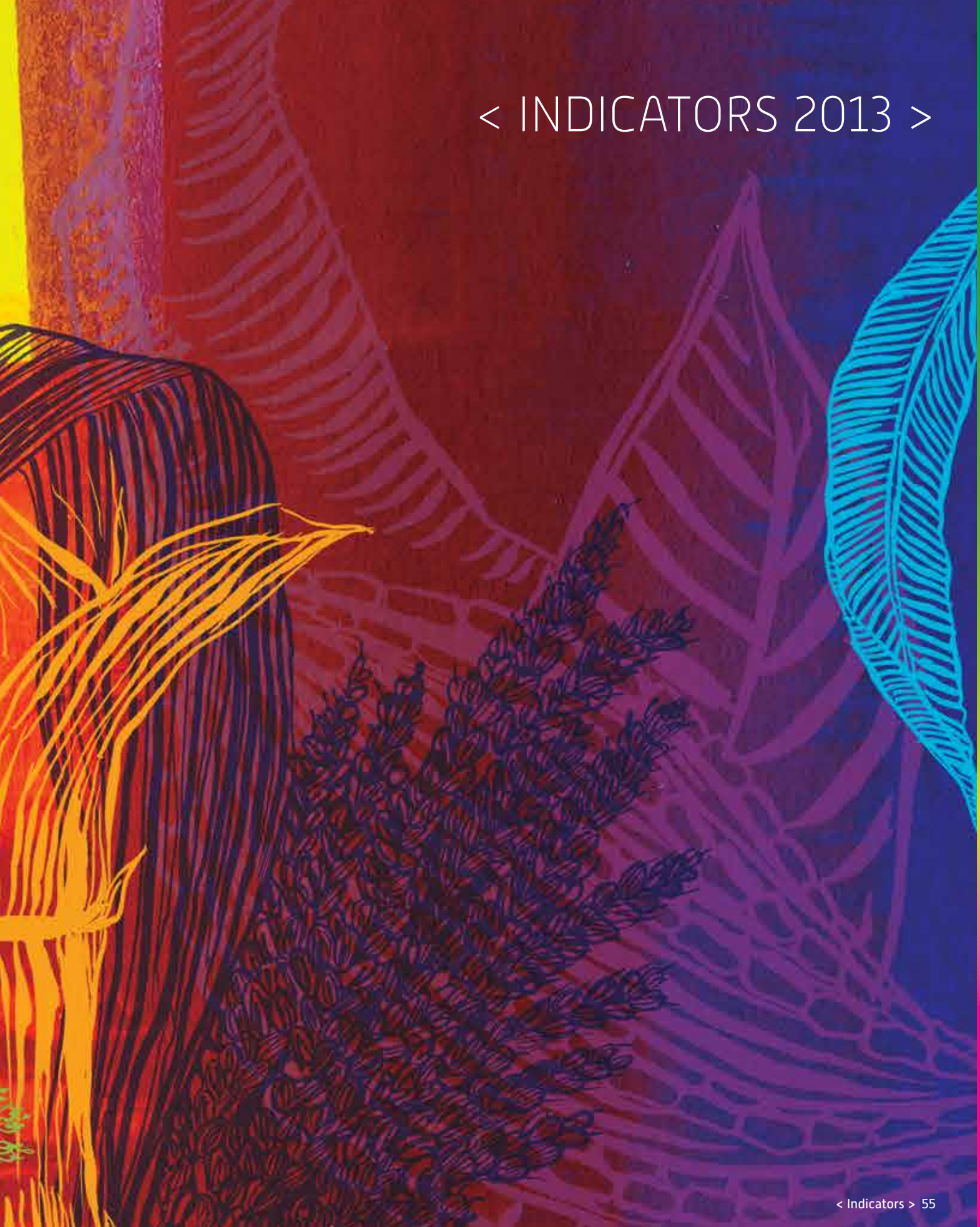
Jacques Weber was a provocative, visionary and enlightening economist and anthropologist. This book is for anyone who had the honour and pleasure of journeying alongside him over some 40 years, but also for a broader public concerned by the future of our planet and hoping to gain an insight into the major questions of the 21st century, from poverty alleviation to the values of biodiversity.

Jacques Weber was a man of surprising, far from ready-made ideas. Those ideas, which he readily expressed to anyone willing to take them on, are now fuelling public debate and helping to build "scientific democracy".

Jacques Weber died on 6 March 2014.

© CIRAD

< INDICATORS 2013 >



< INDICATORS 2013 >

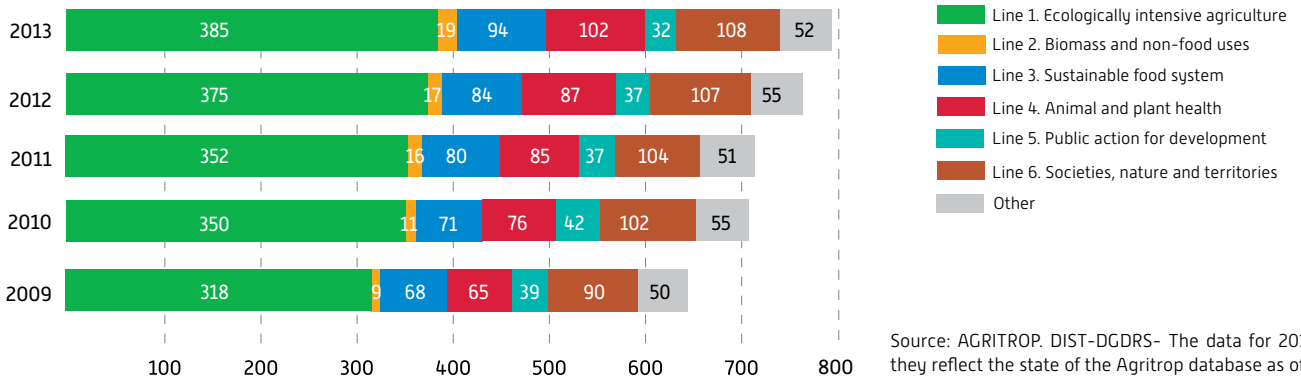
The upcoming implementation of the new contract of objectives for 2014-2018 will set out the four ambitions of the CIRAD Strategic Vision of June 2012 "serving as a global reference in terms of our scientific priorities; co-constructing strategic agricultural research for development partnerships; establishing the conditions for effective innovation; changing in order to measure up to our ambitions", by adding a limited number of indicators.

In order to ensure continuous monitoring of the organisation's activities, the 2013 annual report presents the changes to the main indicators since 2008-2009, according to the four areas of action of the previous contract.

> The ambition of sharing science to meet the challenges facing southern countries

"The ambition of sharing science to meet the challenges facing southern countries" means adapting existing forms of scientific partnerships in order to address research issues that are relevant to development in southern countries. Mobilising research teams to work on the six priority lines of research set out in CIRAD's strategy and updated in 2012, and building capacity in southern countries, are central to this challenge.

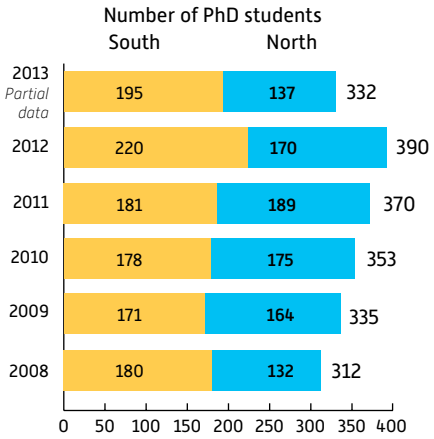
Proportion of CIRAD's publications per line of research



Source: AGRITROP. DIST-DGDRS- The data for 2013 are partial: they reflect the state of the Agritrop database as of 28/02/2014

CIRAD has chosen to develop a balanced and sustainable partnership with its scientific partners in southern countries. This is shown by the steady increase in the number of co-publications with at least one operator from the South between 2009 and 2013 (from 293 to 403). But the number of PhD students from southern countries supervised by CIRAD researchers decreased in 2013 (-12.8%), as did the number of those from northern countries (-19.4%). A review of the PhD student monitoring system will confirm or contradict these figures and explain them.

Supervision of PhD students by CIRAD researchers (Source: DGDRS)



Co-publications with researchers in Southern countries*

Peer-reviewed journal articles, with or without impact factor *Data smoothed over three yearss*	2009	2010	2011	2012	2013**
Articles published with at least one southern author	293	328	352	378	403
Total number of peer-reviewed articles	**639**	**708**	**725**	**765**	**791**

Source: Agritrop. Dist-DGDRS
** The 2013 data are partial (as of 28/02/2013)

* A country is classified as a Southern country if it is on the OECD/DAC list of official development assistance recipient countries.

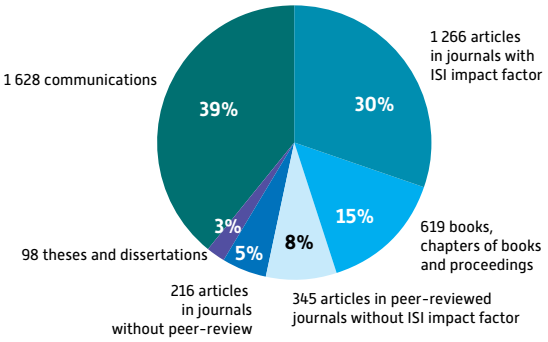
> Diversified, high-quality scientific output

In order to ensure that science for development attains the highest international scientific level and yet remains relevant to the issues, areas and partnerships specific to southern countries, CIRAD is striving to improve the quality of its scientific publications and the competitiveness of its teams. At the same time, it is ensuring the diversity of its outputs, which are aimed at different audiences.

Scientific output is diversified, with steady growth in the number of articles published between 2009 and 2013, particularly in journals with an impact factor, while CIRAD researchers are continuing to become more qualified (number of directors of research[1]: + 13.1% from 2012 to 2013).). Outreach activities are stable.

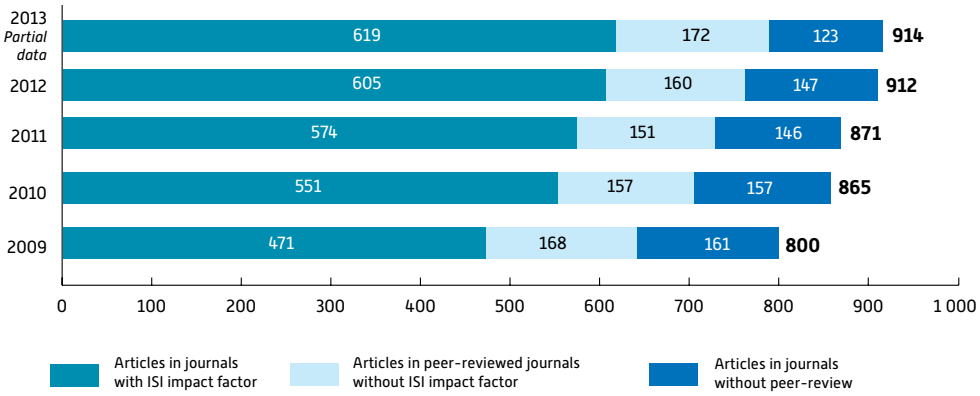
Distribution of publications between 2012 and 2013

Source: AGRITROP. DIST-DGDRS.
The 2013 data are partial (as of 28/02/2014)



Change in the number of articles since 2009

Source: Agritrop. Dist-DGDRS.
The 2013 data are partial (as of 28/02/2014)



Research training for CIRAD's senior scientific staff

Number of "research directors" at CIRAD

2007	2008	2009	2010	2011	2012	2013
82	90	99	102	132	137	155

Source: SIRH (HDR), DGDRD ; Annual reports-DGDRS (prof-consultants)

Outreach: patents, proprietary variety protection certificates and software programmes

Number of applications for patents, proprietary variety protection certificates and software programmes (in brackets: number of patents attributed)

2007	2008	2009	2010	2011	2012	2013
8 (2)	13 (0)	26 (4)	10 (5)	8 (2)	8 (3)	9 (0)

Source: DELVALO, DGDRS

> National agricultural research open to Europe and the rest of the world

CIRAD's activities continued in 2013, on different levels: regionally, within research and training organisations, (PRES in Languedoc Roussillon and the French overseas departments; the sustainable development campus in Nogent-sur-Marne); nationally, in France as part of Agreenium, the national consortium, with other research organisations involved in Programme 187, particularly the IRD, and more actively with research alliances, particularly AllEnvi; in Europe, with reinforced partnerships with the European Commission and Wageningen University; and lastly, internationally, with the renewal of its partnerships in southern countries centring on 21 research platforms in partnership (RPPs) and the strengthening of its links with the Consultative Group on International Agricultural Research (CGIAR).

In particular, the evolution in co-publications illustrates the priority given to southern countries, Europe and international operations. In 2013, overseas postings for CIRAD researchers increased by 3%, especially in Latin America, Asia and the French overseas departments and territories, while concentrating on the platforms in partnership (+19%), the number of which remained stable in 2013, (21 international RPPs, with 11 in Africa, 5 in Latin America, 4 in Asia, 1 in the Mediterranean, and 7 in the French overseas departments). The number of short-term overseas assignments fell by 11%, in particular in sub-Saharan Africa. The success rate as regards FP7 calls for proposals fell, while the number of projects coordinated increased; these figures, after the temporary increase in 2012, are following the project cycle.

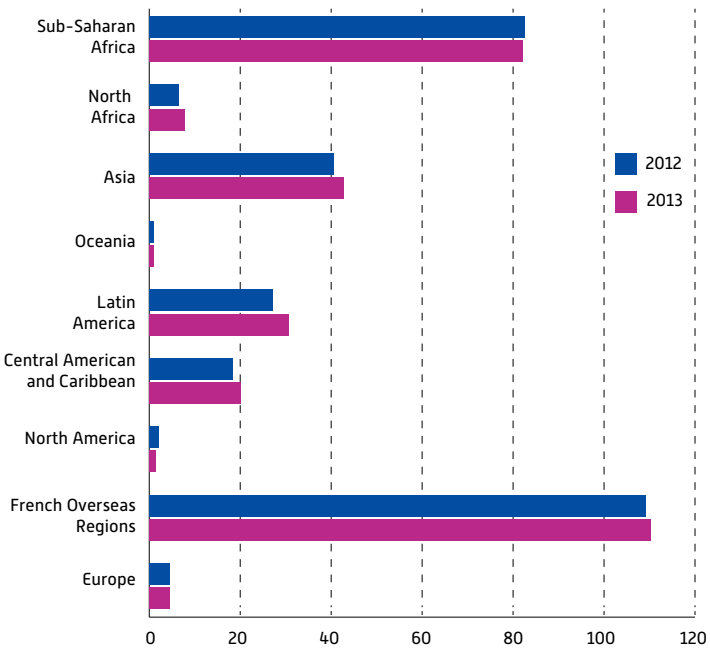
Co-publications with French, European or international researchers

The calculations indicate presence (non-additive values because, for example, the same article could be signed by a French researcher, as well as by an international researcher)

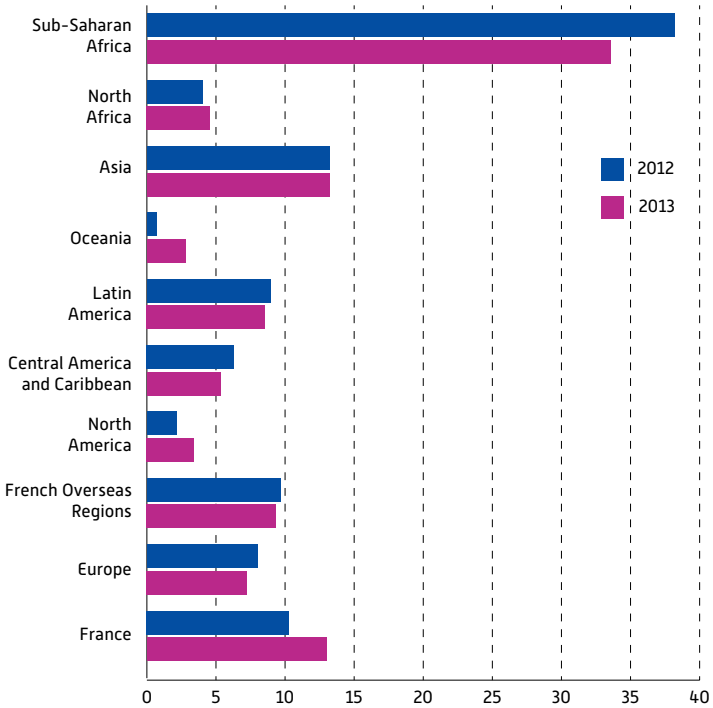
	2009	2010	2011	2012	2013*
Articles published with at least one southern author	293	328	352	378	403
Articles published with at least one non-EU international author	339	382	402	433	460
Articles published with at least one EU 28 author, excluding France	84	104	115	124	132
Articles published with a French research institution	292	312	320	339	361
Articles published with INRA	118	124	120	124	127
Total number of peer-reviewed articles (*)	**639**	**708**	**725**	**765**	**791**

Source: AGRITROP, DIST. DGDRS. * Partial data

Distribution of overseas postings, according to destination
(full-time equivalent)



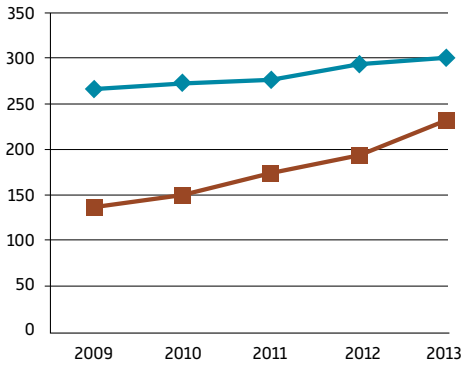
Distribution of assignments according to destination
(as % full-time equivalent*)



Source: SIRH-DGDRD.

* Full-time equivalent fell from 220 to 200 days in 2013

Number* of senior scientific staff members (CS) assigned to research platforms in partnership (RPPs) (—■—) / Number of senior scientific staff on overseas postings (—◆—)



	2009	2010	2011	2012	2013
Number of international RPPs	20	20	14	21	21
Number of overseas RPPs	3	7	7	7	7

*In full-time equivalent. Source: SIRH-DGDRD

Table of research platforms in partnership (RPPs) overseas and in the French overseas departments (DOMs)

Region	National RPPs	Regional RPPs	DOM	RPPs in DOM
Africa				
	PPZS, Senegal, lines 1-5-6	ASAP, West Africa, lines 1-4-6	**Réunion**	3P , line 1
	RP-PCP, Zimbabwe, lines 1-4-6	DPFAC, Congo Basin Forests, Central Africa, lines 1-6		REAGIR, line 6
	CRDPI, Congo, lines 1-6	SISTO, West Africa, lines 3-5-6		KAPPA, line 3
	Forest Biodiversity, Madagascar, lines 2-6	DIVECOSYS, line 1, West Africa		
	Agroforestery PCP Cameroon, lines 2-6			
	PP & G, South Africa, lines 5-6			
	SPAD, Madagascar, lines 1-6			
Asia				
	HRPP, Thailand, line 1	RCP CANSEA (RACASE), Southeast Asia, line 1		
	MALICA, Vietnam, lines 3, 5	GREASE, Animal health and emerging diseases, line 4		
Latin America				
	PCP-AFS-PC "Agroforestry Systems with Perennial Crops", Central America, lines 1-5-6	AMAZONIE, Amazon Basin, line 6	**Caribbean French Guiana**	Forests
	CIBA, Brazil, line 1	PP&I-A, Latin America (10 countries), lines 5-6		Agro-ecology and multi-species cropping systems
				Biodiversity and genetics
		RéSA-CaribVET, line 4 Guadeloupe-Caribbean-Amazon		Emerging diseases and animal health, line 4
Mediterranean				
	SIRMA, North Africa, lines 1-5-6			

Source: Partnerships Office, DGDRS

CIRAD's EU research and development projects (FP) between 2007 and 2013

	2008	2009	2010	2011	2012	2013
Number of projects submitted	23	23	18	21	20	24
Number of projects funded	7	11	7	5	8	7
Success rate (%)	30	48	39	24	40	29
Number of projects coordinated by CIRAD	4	3	2	3	0	3

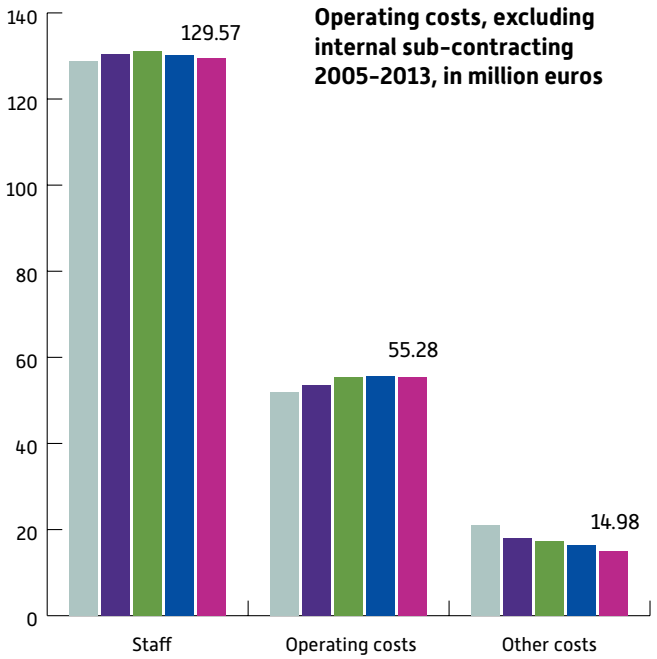
Source: Europe Office, DGDRS

> A structure and resources adapted to meet new challenges

In addition to simplifying and modernising its management methods so that they are more effectively driven by its scientific objectives, CIRAD is continuing to optimise its human and financial resources by ensuring a degree of stability.

CIRAD adjusted its operating costs in 2013 as a result of the stagnation in public subsidies, which has had an impact on the change in the number of agents (full-time staff in particular). Contractual resources, which were down in 2012, have stabilised thanks to the increase in private funding and overseas public funding, and the maintenance of French public funds, whereas European funds are diminishing (structural funds and R&D funds).

Operating costs, excluding internal sub-contracting 2005-2013, in million euros



Total CIRAD staff (full-time equivalent)

FTEs at CIRAD	2008	2009	2010	2011	2012	2013
Number of "classified paid" permanent contracts	1 755	1 764	1 752	1 739	1 717	1681
Number of grant-funded PhD students	48	71	83	81	72.6	73.6

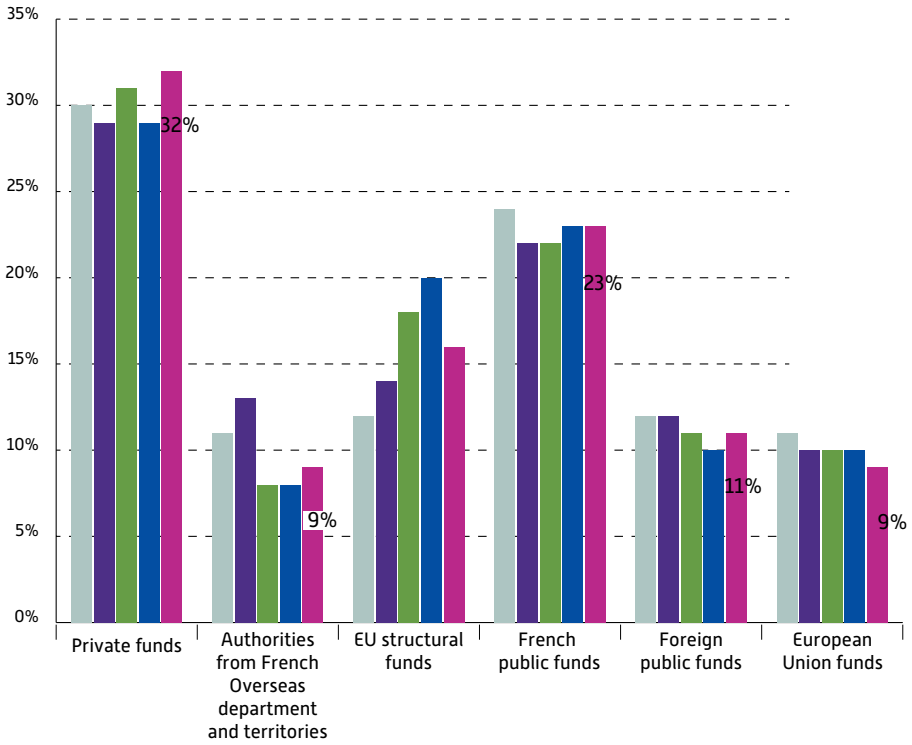
Source: SIRH-DGDRD

Annual breakdown of "classified paid" jobs per category (including grant-funded research students with CIRAD contracts), *as a percentage*

	2008	2009	2010	2011	2012	2013
Senior staff	58.8	59.2	59.6	60.6	62	62.9
Grant funded PhD students	2.7	3.9	4.6	4.5	4.1	4.2
White-collar staff	31.8	31.4	31.5	31.6	31.5	31
Ancillary staff	6.7	5.5	4.4	3.4	2.4	1.8

Source: SIRH-DGDRD

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



Source for both graphs: DCAF, DGDRD (see *Management report*)

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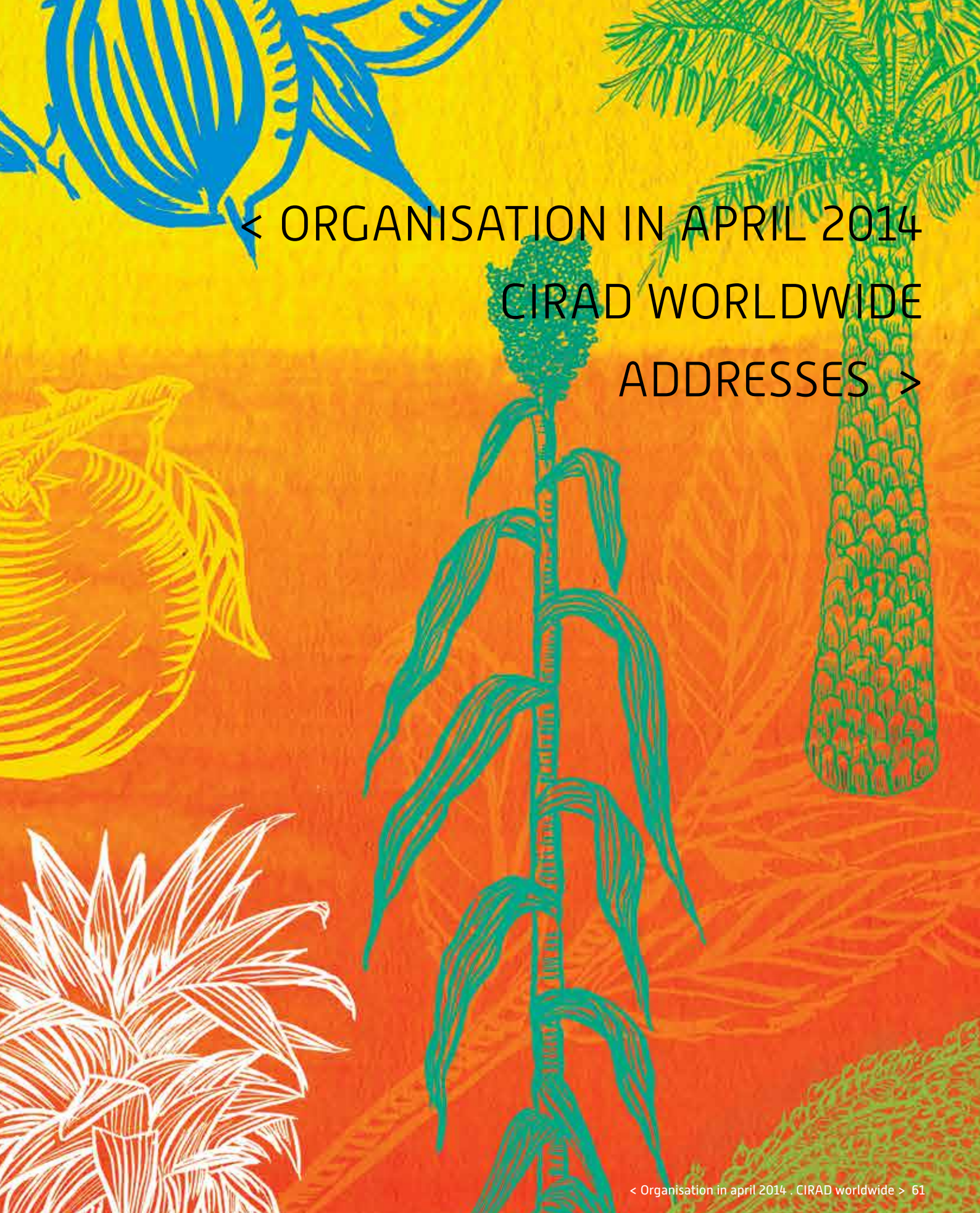

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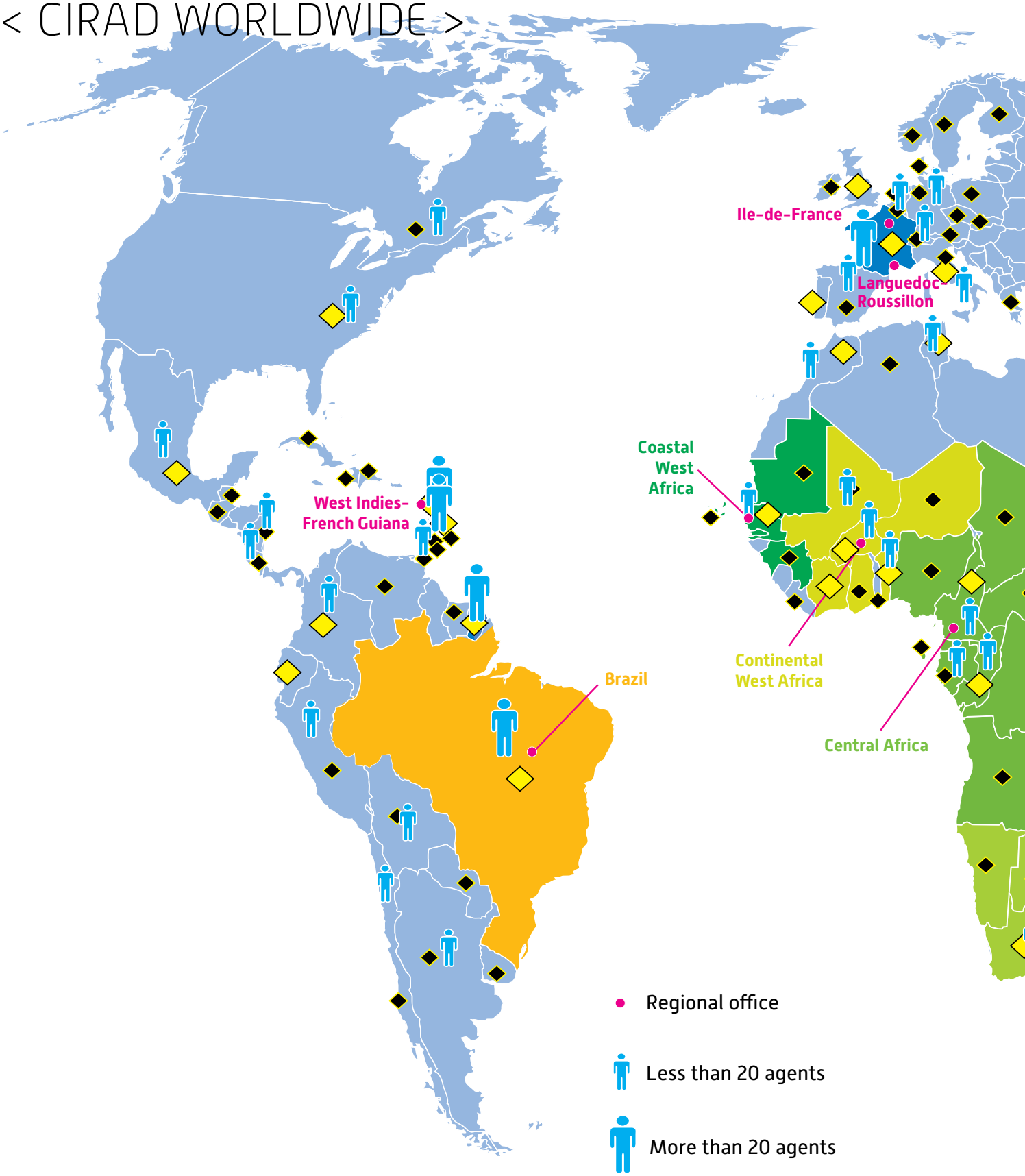

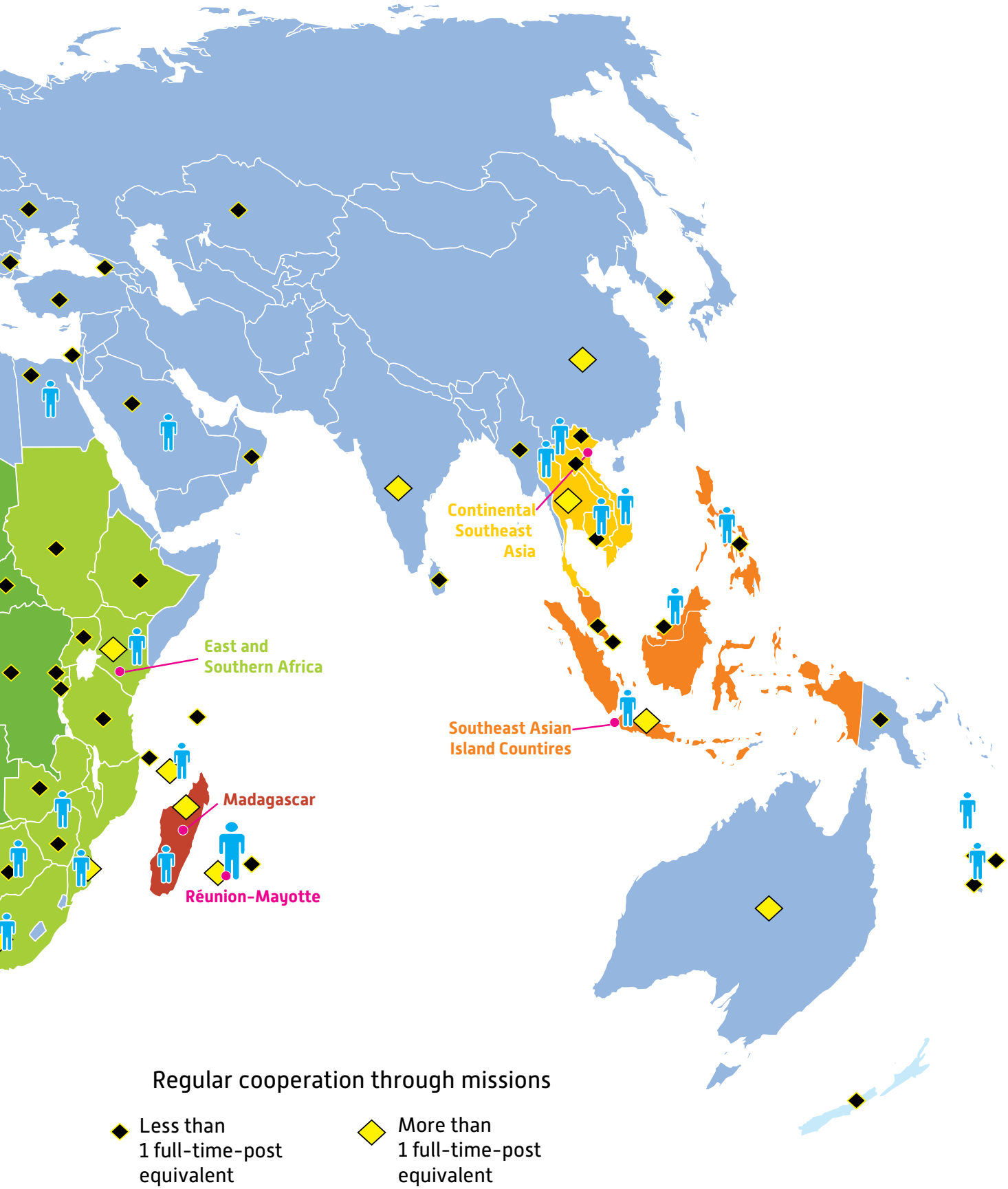
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Distribution and promotion: Christiane Jacquet

Graphic design and layout: Patricia Doucet

Cover illustration: Nathalie Le Gall

Printing: Impact Imprimerie, Saint-Gély-du-Fesc

Printed with vegetables inks on recycled paper
(Offset Cocoon 100grs.)

Also published in french

Legal deposit: October 2014

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ISBN: 978-2-87614-701-0
EAN: 9782876147010