



VIP

VALORISATION
& INNOVATION
en PARTENARIAT

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Editorial

How can we feed the world's people and supply them with renewable materials in the light of current climate change?

Global population growth and the subsequent pressure on cultivable land mean that we need to intensify crop production even further, while protecting the environment. Moreover, the demand from consumers or processing firms is increasingly diversified, precise and stringent. A major part of the solution to this set of constraints lies in crop breeding, which needs to make use of the whole range of available techniques: conventional hybridization using related genetic resources and biotechnologies. This research requires increasing levels of scientific expertise, skills and, obviously, resources, and the burden has to be shared between the public and private sectors, from seed producers to consumers or end users.

This special issue on planting material illustrates the range of crop breeding programmes CIRAD is conducting with its partners worldwide, on pineapple, citrus fruit, banana, coffee, sugarcane, cotton, rubber, oil palm, rice, sorghum, teak, etc. Don't hesitate to get in touch if you are keen to work with us or are interested in our varieties!

Henri FEYT

CIRAD Technology Transfer
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Protecting cotton varieties in Africa

OAPI (African Intellectual Property Organization), which covers 16 countries in West and central Africa, was set up on 01/01/2006 to protect new plant varieties. By special dispensation, and only in 2006, protection could be requested for varieties already on the market, provided they met certain criteria: distinctiveness, homogeneity, stability and denomination. CIRAD and its cotton breeding partners in Burkina Faso, Cameroon, Senegal and Togo have recently submitted eight applications for cotton varieties grown widely in these countries, illustrating the success of their joint research work.

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A rubber variety evaluation network

CIRAD and Michelin have been working together for more than 15 years to counter the devastating effects of the fungus *Microcyclus ulei* in rubber plantings. Genetic, genomic and epidemiological approaches have all produced very encouraging results: 13 new rubber varieties have been bred that are both tolerant of the fungus and high-yielding. These varieties are now ready for dissemination, to assess their performance in the field, in Asia and Africa.

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About food and sensors

A technology meeting on identifying and characterizing agricultural and food products was held in Montpellier on 22 and 23 March. It was organized by Oséo innovation and Agropolis International, with the participation of CIRAD, and was attended by representatives of 70 firms, research organizations and innovation funding bodies from France and the rest of Europe. Tours of firms and laboratories enabled the participants to see concrete examples and discuss the prospects for innovation, particularly at the CIRAD technology hall (optical sensors, mass spectrometry, etc).

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Oil palm seed marketing

Creating improved planting material as a concrete result of its research operations is a priority for CIRAD. Such material is the fruit of many years' collaborative research, and is propagated and produced with all the necessary guarantees that it is true to type and of high sanitary quality, and offers good striking rates after planting. The CIRAD Planting Material Sales Unit sells mainly oil palm seeds and oversees relations with suppliers, distributors and licensed producers.

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Organic matter management

In both North and South, there is growing interest in recycling organic matter in agriculture. CIRAD runs training courses on the agronomic and environmental impact of organic matter management. A pilot session was organized in October 2006 in Montpellier, for 12 participants from Martinique, New Caledonia, Burkina Faso, Cameroon, Mali, Senegal, Madagascar and Vietnam. Further sessions can be organized in developing countries on request. The courses are intended for anyone responsible for agricultural and agroindustrial development or conservation.

For further information: www.cirad.fr/ur/recyclage_risque

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ISSUE

PLANTING MATERIAL



► SUGARCANE VARIETAL CREATION

Industrial cultivation of sugarcane requires varieties that are resistant to pests and diseases and tolerant of water stress, since droughts are frequent and pesticides are not widely used. Moreover, the sugar market is highly competitive. CIRAD is working to create improved sugarcane varieties, from its base in Guadeloupe, in close collaboration with the central breeding station in Barbados and the *Centre d'essai, de recherche et de formation* (CERF) in Réunion.

CIRAD is working to create improved sugarcane varieties

Every year, around fifty pre-selected varieties are sent to our partners in developing countries, via the European quarantine greenhouse at CIRAD in Montpellier. This ensures the sanitary quality of the planting material dispatched to users. Studying varietal performance in various production systems serves to identify the most appropriate planting material for each environment. Several varieties are looking promising in Guadeloupe, China, Ivory Coast and Uganda, where four CIRAD varieties are being grown on an industrial scale. ■

►► ARE YOU INTERESTED IN OUR VARIETIES?

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► HYBRID UPLAND RICE VARIETIES

In the mountains of China and the Greater Mekong region, traditional upland rice growing after slash-and-burn has gradually damaged the ecosystem. Food security, which centres on rice, is now under threat. In the hope of reversing the trend, the authorities are subsidizing the building of terraces, but how can rice requirements for food be covered by the small areas those terraces represent? CIRAD is working with the Yunnan Academy of Agricultural Sciences and the Carrefour International Foundation to develop rice varieties that combine productivity and suitability for cultivation in dry fields, by exploiting hybrid vigour. In an approach that is new for non-irrigated rice cropping, hybrid upland rice varieties have been created: several are very high-yielding, producing 7 to 8 tonnes a hectare. Multi-site tests of three hybrids are due to start in 2007, with the possibility of their dissemination on 100 000 hectares or thereabouts. ■

rice varieties that combine productivity and suitability for cultivation in dry fields

►► ARE YOU INTERESTED IN THIS PROJECT?

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► THE FUTURE LOOKS ROSY FOR THE SMALL CITRUS FRUIT MARKET

The global market for small citrus fruits, for instance clementines and mandarins, is booming. Many countries are keen to extend the harvesting period and make their products stand out from the crowd. It is vital that these fruits, which are intended for the fresh fruit market, be pipless. The aim is thus to breed new varieties in which both females and males are sterile, to prevent any cross-pollination. To this end, CIRAD is working to develop new triploid mandarin varieties. In effect, a triple set of chromosomes guarantees high levels of gametic sterility. These varietal innovation projects are being conducted in partnership with fresh fruit producers and nurserymen (Morocco, California, Chile, prospects with South Africa and Corsica). The first triploid mandarin hybrids look promising. ■

the first triploid mandarin hybrids look promising

►► WOULD YOU LIKE TO WORK WITH US?

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Participatory breeding of sorghum in Nicaragua.

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Market

► BREEDING CLONES, IN VITRO PLANTLETS AND NEW BANANA HYBRIDS

Almost all the banana plants used for fruit production come from a single variety. CIRAD has bred several clones of the variety, based on their productivity and nematode tolerance. It was also a leading light in the development of in vitro propagation and sanitary certification techniques to facilitate the use of elite material in the various production zones. Combining in vitro plantlets, which are of excellent sanitary quality, and soils "rested" by a fallow period or a rotation enables a massive reduction in nematicide use and adverse environmental impact. The economic gain is also significant. These selected clones of agricultural interest are distributed by Vitropic SA, a CIRAD subsidiary that produces three million in vitro plantlets a year.

development of in vitro propagation and sanitary certification techniques

CIRAD is also working on an ambitious dessert banana improvement programme, in partnership with the production sector in the French West Indies, and a similar programme on cooking bananas, with the *Centre africain de recherche sur les bananiers et les plantains* (CARBAP) in Cameroon. Several varieties resistant to *Cercospora* diseases and tolerant of nematodes are currently being assessed by producers and other players in the commodity chain. ■

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ARABICA COFFEE HYBRIDS FOR LATIN AMERICA

The traditional coffee varieties grown in Latin America are all susceptible to the same parasites. A varietal improvement programme began in 1991. CIRAD, CATIE (Centro Agronómico Tropical de Investigación y Enseñanza, Costa Rica) and coffee sector organizations in Costa Rica, Guatemala, Honduras and El Salvador are developing new clones from arabica coffee hybrids. The best arabica clones created to date produce 30 to 40% more than current commercial varieties, and their cup quality is also good. The next step is to disseminate these new varieties.

CIRAD has developed a technique for propagating clones by somatic embryogenesis

CIRAD has developed a technique for propagating clones by somatic embryogenesis. In 2004, the agroindustrial group ECOM, with scientific support from CIRAD, set up an industrial micropropagation laboratory in Nicaragua, with a capacity of three million plantlets a year. Commercial-scale production of plantlets at the laboratory is scheduled to begin in 2008. The plantlets will be distributed by ECOM. ■

COTTON BREEDING IN SOUTH AMERICA

CIRAD has been involved in cotton breeding operations in South America for 40 years. Cotton is the leading export crop in Paraguay, but the North American varieties grown traditionally were susceptible to bacterial wilt (*Xanthomonas campestris* pv. *Malvacearum*). Cooperation with CIRAD began in 1967, to create more resistant varieties by using African genetic resources resistant to the disease. Five varieties in succession were disseminated by the Ministry of Agriculture and Livestock and the chamber of cotton processors, resulting in a significant increase in both yields and the area planted.

In Brazil, COODETEC, a group of producer cooperatives, called upon CIRAD in 1990. Ten high-yielding varieties with good fibre quality were created by crossing traditional varieties with others from Paraguay and Africa. Similar results were obtained in Bolivia, in conjunction with the cotton producers' association.

These new varieties have made a major contribution to cotton development. They are now protected by UPOV (International Union for the Protection of New Varieties of

Plant). Sales generate royalties that are ploughed back into research to benefit cotton producers. ■

royalties that are ploughed back into research to benefit cotton producers

ARE YOU INTERESTED IN OUR VARIETIES?

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INDUSTRIAL PRODUCTION OF SELECTED TEAK CLONES

Setting up teak plantations with trees grown from seed is hampered by low germination rates and the high heterogeneity of the individuals produced.

Prompted by strong demand for planting material that produces top quality teak as quickly as possible, CIRAD has developed an industrial technique for cloning teak plants with the best characteristics, under horticultural conditions and in vitro. Intensive propagation by cuttings enables large-scale production of cuttings from old selected teak trees, with good yields. However, a long dry season and a production target of more than 100 000 plants a year are an argument in favour of in vitro micropropagation. Several million in vitro plantlets have already been produced in a very economical way. These in vitro plantlets also have the advantage of being suitable for export, to satisfy growing international demand. ■

several million in vitro plantlets have already been produced in a very economical way

ARE YOU INTERESTED IN THIS PROJECT?

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A NEW, TASTY RED PINEAPPLE VARIETY

The pineapple export market was for a long time dependent on a single variety, "smooth Cayenne". New varieties have recently been released onto the European and American markets that differ in terms of their acidity, sweetness and colour. Producers, even smallholders, now appreciate the merits of growing different types, and are taking the plunge.

With this in mind, CIRAD is also developing new varieties, based on a comprehensive pineapple collection in Martinique. Flhoran 41, a new red hybrid with very good organoleptic characteristics, was developed under this improvement programme. It has obvious potential for the fresh fruit market, as it differs from all the current varieties, and also for processing. Moreover, it is resistant to Fusarium wilt, a disease from Central America that is a threat to

every producing zone. Production could shortly be extended to other areas, to supply the North American and North Asian markets. ■

obvious potential for the fresh fruit market, as it differs from all the current varieties

WOULD YOU LIKE MORE INFORMATION?

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PARTICIPATORY BREEDING IN NICARAGUA

In the dry regions of Nicaragua, white sorghum is very important in ensuring food security among farming families. However, few varieties satisfy smallholders' requirements, given the generally non-intensive systems they practise. In 2002, CIRAD and CIAT (Centro Internacional de Agricultura Tropical, Colombia) launched a participatory sorghum breeding programme, in partnership with local producers' organizations, NGOs and the Nicaraguan Agricultural Research Institute. The aim was to develop varieties that satisfy the selection criteria applied by farmers: response to photoperiod, drought tolerance, suitability for intercropping, productivity, grain and fodder quality, etc. Two early and three photoperiodic varieties have been bred jointly with farmers.

these sorghum and rice varieties are being registered in the national catalogue

The project also covers upland rice, and two rice varieties suited to low-input farming systems have been pinpointed. These sorghum and rice varieties are being registered in the national catalogue. ■

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Hacienda La Cabaña

Hacienda La Cabaña is an industrial oil palm plantation in Colombia. CIRAD and Hacienda La Cabaña have been working together for over 20 years to improve plantation productivity in terms of palm oil.

INTERVIEW with Mr Camilo Colmenares, General Manager of Hacienda La Cabaña



What does Hacienda La Cabaña do?

Hacienda La Cabaña has been growing oil palm in eastern Colombia since 1960. We have a total of 3300 hectares, an extraction mill and a kernel oil extraction plant, and now we are partners in a new venture to produce biodiesel, starting in 2008. We also distribute CIRAD® oil palm seeds and will soon start producing these seeds in our country.

How did you get to know CIRAD?

CIRAD has been well known in Colombia since the 1960s because of its involvement with Indupalma, Colombia's biggest oil palm estate. We started to work with CIRAD during the 1980s (Francis Corrado and later Philippe Amblard) because of the proven quality of its planting material, and because it offered a chance for us to fight bud rot, a serious palm disease in our plantation.

Why do you distribute CIRAD® branded oil palm seeds?

Basically we believe there will be a big seed market in Latin America in future, and CIRAD's seeds will have a major market share given their quality and the technical support behind each deal. For ten years now we have distributed CIRAD's African seeds, basing this business on the prestige of the planting material. We have established a seed garden to produce hybrid palm seeds (American oil palm x African oil palm) that is already producing. About four years ago, an African oil palm seed

Hacienda La Cabaña at a glance
Nationality: Colombian
Status: private
Founded: 1960
Staff: 550
Production: 14 500 tons of palm oil per year

garden was planted where we expect to start producing seeds in 2008.

How do you control oil palm diseases, especially bud rots?

Some diseases may be controlled through good maintenance or pest management, but in tropical America, bud rot is still impossible to control. It is even lethal in some parts of Colombia and Ecuador. The only way to withstand this disease is to use resistant planting material, specifically hybrid palms, first developed by CIRAD in the 1980s. Research is under way at La Cabana to breed more resistant planting materials.

What are the most significant results of your collaboration with CIRAD?

The most significant results are the local production of hybrid palm seeds and research into better breeds of this new and promising palm variety. For our region, this planting material will be the answer for future plantings, given its resistance to bud rot, high quality oil, resistance to pests, etc. It is also important that the CIRAD parent palm collections of Africa are now duplicated in America, to secure elite material for seed production.

Do you have any plans for new projects with CIRAD?

We believe that many of the "palms of the future" will be reproduced mainly through tissue culture, so this may be a promising new joint project with CIRAD. We also plan to sell hybrid palm oil, a tropical equivalent of olive oil, on the international market under the NOLI brand.

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Central America

CIRAD has been supporting agricultural development in Central America for 25



years. It works to foster the sustainability of local farming systems and preserve biodiversity and the environment, and favours a regional approach.

CIRAD IN CENTRAL AMERICA

has nine researchers in Costa Rica and El Salvador. Some thirty technical and appraisal missions are carried out each year in the region. It supervises around ten students a year and provides training in agroindustrial processing of fruit and vegetables, ecophysiology, environmental economics and agroforestry. A Research Platform in Partnership (PCP) has just been set up for a ten-year period, associating CIRAD, CATIE (Centro Agronómico Tropical de Investigación y Enseñanza, Costa Rica), INCAE (a Central American business school) CABI and PROMECAFE (a network of Central American organizations working on coffee), and aimed at boosting research and development operations in terms of using perennial crops in agroforestry systems.

Its main fields of operation include:

- the competitiveness and sustainability of coffee- and cocoa-based agroforestry systems;
- coffee: promoting *terroirs*, pest and disease control, and varietal improvement;
- agroindustrial processing of fruit and vegetables and transfer of innovative technology;
- supporting agricultural economies and farmers' organizations;
- adapting cropping systems to climate change and clean development mechanisms.

SPECIFIC EXPERIENCE OF PLANTING MATERIAL

CIRAD researchers are working to breed coffee varieties for resistance to the main crop pests and for cup quality. They are applying their expertise to producing coffee hybrids in Latin America. They are also working on oil palm, to develop a ramet production protocol centring on embryogenic suspensions in a liquid medium.

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