

# Oil palm commodity chain: economic context and research overview





## Recent developments in the commodity chain

The oil palm commodity chain has recently had to deal with two distinct events. Firstly, in 1998, world palm oil prices reached their highest level for 15 years (663 USD per tonne on average) due to the economic crisis in Asia, which struck Indonesia, the world's second largest producer, head on, and the after-effect of the drought in 1997 caused by El Niño. Then, in 1999, surplus soybean production and the devaluation of the Brazilian Real led to rapid erosion of oil prices from January to July, and their subsequent stagnation (462 USD per tonne on average in 1999).

The main consequence of the Indonesian crisis was a freeze on the extension programmes of large private estates. In Africa, the price drop in 1999 threw into confusion a profession that was still insufficiently organized after the wave of privatizations, notably in Côte d'Ivoire. The cooperative sector is not yet operational and is late in compensating for State withdrawal. The privatization of State-owned companies is continuing in Cameroon (Socapalm, CDC). In Latin America, the commodity chain is becoming increasingly dynamic, especially in Colombia and Ecuador, despite the constant threat of bud rot.

## Oil Palm Programme research priorities

In order to accompany and remain abreast of developments in a commodity chain in the midst of restructuring, the Programme has centred its research on four priority topics.

The first involves support to smallholders: it is important to define a "smallholder" typology and analyse organization in this sector.

The second research topic covers sustainable intensification factors: genetic improvement programmes are continuing and are now backed up by molecular biology. An overall "precision agronomy" approach, combining ecophysiological modelling and geographic information systems, is being taken to fine-tune fertility management in plantations.

The third topic is integrated control of bud rot, which is the main obstacle to the development of oil palm cultivation in Latin America.

Vegetative propagation by somatic embryogenesis is the fourth topic: research is focusing on the molecular determinism of somaclonal variations.

## Support to smallholdings integrating oil palm

This research topic, which is new for the Programme, is endeavouring in the first instance to establish a typology of family farms, identify their capacity for sustainable innovations, and ascertain what they require from research. In 1999, two young researchers were recruited: an agronomist specialized in farming systems and an agricultural economist assigned to Cameroon and Côte d'Ivoire respectively.

In Cameroon, an initial study conducted in collaboration with IRAD and IITA led to the definition of a typology of farms to be studied in 2000, along with their zoning.

In Côte d'Ivoire, three lines of research will be developed under a research agreement with the University of Bouaké: institutional rules and logics in the context of commodity channel liberalization, development of the oil palm sector and land management, innovations and changes in the smallholder and small-scale production sector, and their consequences.

## Oil palm sustainable intensification factors

An ambitious marker-assisted breeding programme has been launched. More than 121 microsatellite markers specific to oil palm have been developed. Reference genetic mapping of the oil palm is under way. At the same time, genetic blocks are continuing to be extended and exploited: in Indonesia with the Aek Loba Timur project (SOCFINDO); in Benin with SRPH at Pobé and in Cameroon with IRAD at La Dibamba. These trials are also intended to determine the agronomic value of planting material and study interactions between genotype and environment. They are thus helping to enrich the data in the network of breeding programmes formed by our partners.

Methods to diagnose the nutritional condition of oil palm plantings have been

strengthened with the development of geographic information systems to monitor the PT SMART estates in Indonesia. An assessment of satellite remote sensing as a decision-making aid has begun. The limitations of leaf diagnosis are also being investigated, along with additional actions to be taken to improve its relevance and integration in an overall precision agronomy type approach.

In collaboration with the INRA centre in Versailles, for integrated control of *Oryctes*, the Oil Palm Programme is continuing research on volatile compounds from rotting empty bunches, which may act in synergy with pheromones to trap these Coleoptera and assess insect populations.

### Integrated control of bud rot

The hypothesis that this disease is transmitted by *Scaptocoris* sp., a soil-borne piercing insect, has yet to be demonstrated. To date, genetic control remains the most promising strategy. Trials have been set up in partnership with plantation companies in Ecuador (Palmeras de los Andes, Indupalma) and in Colombia (La Cabana) in order to determine differences in susceptibility within the species *E. guineensis*. At the same time, the selection of *E. guineensis* x *E. oleifera* interspecific hybrids and introgression of *E. oleifera* genes in *E. guineensis* are continuing.

A research programme on molecular markers of tolerance has been drawn up and is now operational. Based on a back-cross, embryo clones will be planted in an endemic zone with a view to associating molecular markers with the most tolerant clones.

### Mastering and developing vegetative propagation by somatic embryogenesis

In order to understand and control somaclonal variations, a joint CIRAD-CP/IRD team has launched a research programme in Montpellier using molecular biology techniques. The ultimate aim of this work is to identify molecular markers of the floral abnormality, in order to eliminate off-type plants before they are planted out.

Two overall approaches have been taken: an analysis of the genome structure and of its methylation rate in relation to the floral abnormality, and a study of differential gene expression between variant and normal materials.

On a genome scale, the methylation rate has been quantified using a method based on high pressure liquid chromatography,

#### The Oil Palm Programme at a glance

38 staff, including 28 researchers  
*Partner countries* : France, Côte d'Ivoire, Cameroon, Indonesia, Ecuador, Brazil  
*Institutions*:  
 France: IRD, INRA, CNRS, universities of Paris VI, Paris XI, Montpellier II  
*Private companies*:  
 Agro-industrial companies  
*Research topics*:  
 - Support to smallholders  
 - Factors of sustainable intensification  
 - Integrated control of bud rot  
 - Vegetative propagation by somatic embryogenesis

along with another enzymatic type method, SssI-methylase accepting assay. Significant hypomethylation (0.5-2.5%) has been found in variant regenerants.

A programme of differential analysis of RNA populations from normal and abnormal regenerants was launched to identify the genes involved in the "mantled" abnormality. The technique adopted for this study was differential display reverse transcriptase-polymerase chain reaction (DDRT-PCR). This work was undertaken in conjunction with the plant biotechnology institute at the University of Paris XI, in Orsay, in connection with a project funded by the MPOB (formerly PORIM).

### Scientific partners

Research and development operations are carried out in a rich and diversified partnership with French and European research centres, national research centres in producing countries and the agro-industrial sector.

In countries of the South, these particularly involve:

- the University of Bouaké (Côte d'Ivoire) and IRAD (Cameroon) for smallholder agricultural socio-economics,
- CNRA (Côte d'Ivoire), INRAB (Benin), IRAD (Cameroon), EMBRAPA (Brazil), SOCFINDO and IOPRI (Indonesia) for breeding activities,
- MPOB and FELDA (Malaysia), IOPRI and SOCFINDO (Indonesia), CNRA (Côte d'Ivoire) for biotechnology (*in vitro* culture and molecular markers),
- PT SMART and SOCFINDO (Indonesia) for fertilization and numerous other private and State partners, in Africa and Latin America,

- IOPRI (Indonesia), CNRA (Côte d'Ivoire), Palmeras del Ecuador (Ecuador) and Palmas del Espino (Peru) for integrated control of pests and diseases.

In industrialized countries, the scientific partners of the Programme are mainly:

- IRD for the study of somatic embryogenesis micropropagation protocols and the search for molecular markers of somaclonal variations,
- INRA in Versailles for olfactory pest trapping,
- CNRS-IBP in Orsay for molecular biology and somaclonal variations,
- Flottweg (Germany) for the Drupalm® extraction process,
- the Universities of Leicester and Exeter and IACR's Long Ashton Centre (UK) for molecular biology.

The gradual establishment of UMR (mixed research units) will enable greater integration of our research programmes in national academic structures, along with greater involvement of the Programme's researchers in teaching. ■