



INTERNATIONAL ORGANIZATION
ORGANIZACIÓN INTERNACIONAL DEL CAFÉ
ORGANIZAÇÃO INTERNACIONAL DO CAFÉ
ORGANISATION INTERNATIONALE DU CAFÉ

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Projects Committee
2nd Meeting
29 September 2011
London, United Kingdom

**Cooperation with the
International Coffee Genome Network (ICGN)**

Background

1. In November 2010, the Executive Director a.i. circulated document ED-2105/10 requesting Members, in consultation with their research institutions and coffee sectors, to send him all relevant data and research on the coffee genome including documents and reports on existing projects and proposals and past or ongoing research. Members were also invited to send their views on proposals already submitted to the ICO and to suggest donors to implement this type of initiative.
2. This matter will be discussed during the meeting of the Projects Committee on 29 September 2011 to review the different initiatives and work being carried out, building on existing expertise and findings, to establish priorities for the future and explore potential sources of financing.
3. Copies of responses received to date are attached. Members who have not yet replied are invited to send their contributions to the Executive Director a.i. no later than 31 August 2011. Submissions should be sent in English as this is the language used by the international scientific research community.

Action

The Projects Committee is requested to consider this document.

Responses received from Members:

Colombia

For a number of years the Federation, through the National Coffee Research Centre (Cenicafé) has developed various advanced strategies for controlling pests and diseases and improving coffee quality attributes. In the context of studies on the coffee genome, Coffee Berry Borer (CBB) and its control through *Beauveria bassiana*, Cenicafé has identified the sequences of 32,000 genes in the *Coffea arabica* species and has prepared genetic and physical maps that permit the characterization of resistance to diseases, factors related to production, and environmental interaction.

The following link provides more detailed description of these developments:
http://www.cenicafe.org/modules.php?name=Genoma_del_Cafe&lite=0.

Databases for publications relating to the coffee genome are available at the Cenicafé *Alberto Machado Sierra* Documentation Centre. The following link provides on-line consultations, as well as around 30 related search requests: <http://www.cenicafe.org/cgi-bin/wxis1?IsisScript=consulta.xis&isisdb=cenic&expression=genoma&format=1&desple=30>.

Over the past six years Cenicafé has developed a Genomics research programme centred on *Coffea arabica* accessions and varieties that have been either preserved or bred in Colombia. The main purposes of the programme so far have included:

- The identification of molecular markers useful in the preparation of a genetic and physical map of this species, and the application of these markers in the characterization of coffee genetic resources, in order to recognize suitable materials for breeding purposes and to define core collections for the preservation of the genetic diversity.
- The identification of genetic markers and genes involved in the plant response to pathogens and pests, in particular Coffee Leaf Rust (CLR) and Coffee Berry Borer (CBB), using genomics to understand the genetics and physiology of the causal agents of these important problems in Colombia: the fungus *Hemileia vastatrix* and the insect *Hypothenemus hampei*.
- The improvement of biological control strategies through the characterization of the diversity and pathogenic activity of the fungus *Beauveria bassiana*, a natural enemy of the CBB.

- The development of new genes that could be used in genetic control strategies against the main limiting biotic problems in Colombia.
- The determination of the interaction between genetic factors and the environment in the quality and metabolites present in coffee, and how this defines the diversity of specialty coffees.
- The development of a Bioinformatics and Computational Biology platform that supports all the information and analysis requirements for the project and that enables the interaction of Cenicafé data with resources around the world.

For an ICO initiative on coffee genomics, Cenicafé is interested in participating with its human resources, technical and data analysis capacities in coffee genomics and related areas, within the scope of the proposed projects presented to ICO in the following areas:

- Comparative genomics for the preservation and characterization of *Coffea arabica* genetic resources, including the parental species *Coffea eugenioides* and *Coffea canephora*, as well as other *Coffea* species of interest including *C. liberica*.
- Wide phenotypic characterization (known as 'Phenomics') for the study of the interaction of genomes and the environment, focused on cup quality, productivity and response to climate change.
- Transcriptomics, Proteomics and Metabolomics to identify metabolic pathways that explain phenotypic responses and support breeding programmes for the development of new varieties together with genomics information.
- Deep genomic characterization of coffee pathogens and pests associated with limiting biotic problems of coffee around the world, including Coffee Berry Disease, Tracheomyces, Pink Disease, Berry Blotch and American Leaf Spot, Root Nematodes and others.
- Metagenomics for understanding the interactions between coffee and the microorganisms associated with it, in relation to disease onset, biological control, nutrient assimilation and adaptation to the environment.
- Bioinformatics to strengthen data storage, processing and availability capabilities.

France



cirad

LA RECHERCHE AGRONOMIQUE
POUR LE DÉVELOPPEMENT

Montpellier, July 18, 2011

Y/R : Document ED 2105/10
O/R : DIRBIOS/2011/123

Coopération avec le Réseau international
sur le génome du café (ICGN)

bernie.nizot@cirad.fr

Subject : ICGN/OIC -- September 2011

Dear Sir/ Madam,

This letter is to confirm the strong support of the French research institutions (CIRAD and IRD) involved in coffee research to the propositions done by the International Coffee Genomics Network (ICGN).

Both institutions are already deeply involved in coffee genomics and research partnerships with several ICO members. In particular, with funding from the French Agency ANR (Agence Nationale de la Recherche), CIRAD and IRD in association with another French institutes (Genoscope-CEA) and several international collaborators are combining their scientific resources and expertise to sequence, assemble, and annotate the entire genome of *Coffea canephora*. The specific goals of the project are i) to produce enough sequences to reach a high genome coverage, ii) to generate a good genome assembly with a majority of the genome anchored to chromosomes, and iii) to perform a first annotation and whole-genome analyses. All generated data will be freely available to the coffee community.

The coffee genome sequence will be used to decipher the genetic and molecular bases of important biological traits in coffee that are relevant to growers, processors, and consumers. This knowledge is fundamental to allow efficient use and preservation of coffee genetic resources for the development of improved cultivars in terms of enhanced quality, yield, and resistance with reduced economic and environmental costs.

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In the next few years, both institutions would be very interested to participate in an international initiative aiming at improving the conservation, characterisation, and use of the world's coffee gene pool for varietal development that meet future demand in a world of changing farming systems and climate. In particular, we could organise specialised training course and host scientists helping them to access and exploit a large amount of genomic and related data. We consider that thousands of undiscovered genes can potentially benefit coffee productivity and quality and the processes to decipher their functions are complex—requiring cutting-edge biotechnology, phenotyping methods, and bioinformatics. An individual institution can cope with only a few at a time. If we are to exploit the coffee genome adequately in a timely manner, a global research effort is needed, integrating the strengths of public and private organizations and facilities from high-tech laboratories to farmers' fields. The ICO, through existing centers and research networks like ICGN as a basis for wider partnerships, is ideally placed to lead this effort.

Please let me know if you require additional information.

I look forward to hearing from you.

Sincerely,


Daniel Barthélémy
Scientific Director Biologic Systems

