

SUMMARY ANNUAL REPORT 2006

PROJECT *IP-06*

**Tropical Fruits, a Delicious Way to
Improve Well-being**



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IP-6 Project

Tropical Fruits, a Delicious Way to Improve Well-Being

1. Project Description and log frame in MTP 2006-2008 t

Goal: To work with partners in the public and private sectors who support rural communities by providing them with information and assistance to produce, process, and market tropical fruits, thus increasing wealth and improving welfare of current and future generations in the countryside.

CIAT PROJECT IP-6: TROPICAL FRUITS (2006-2008)

	Outputs	Intended User	Outcome	Impact
OUTPUT 1	Interactive Web-based information system in place to determine which tropical fruits can grow successfully in a given place: <i>Homologue</i> -What to Grow Where.	Farmer groups, research agencies, development agencies, and entrepreneurs	Rural communities identifying the best options for producing high value products in their own particular niche	Rural communities producing high value products well adapted to their particular ecological conditions
Output Targets 2006	Beta version of <i>homologue</i> with climate factors	Farmer groups, research agencies, development agencies, and entrepreneurs	Rural communities identifying areas similar to theirs for low risk technology and germplasm transfer	
Output Targets 2008	Neotropical fruits data base linked to <i>homologue</i> with soils analysis capacity	<i>Homologue</i> users	Rapid identification of production options for any particular site	

OUTPUT 2	Selection, propagation and targeting methodologies for tropical fruits	Local research and development agencies and farmers groups	Producers planting uniform quality elite fruit materials, selected from existing natural variation, well adapted to specific ecological conditions on their farms.	Increased rural income through increased production of high value readily marketed products
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2. Output Targets 2006.

Output 1:

Beta version of *homologue* with climate factors: Fully achieved. Beta version available and being distributed through CIAT. Report for this output is mentioned in the Project BP2 and therefore is not included in the Annual Report of Tropical Fruits Project.

Output 2:

Methodology for clonal propagation of soursop (model crop) at local nursery level, Fruit tree nurseries. Availability of clean planting material of elite clones well adapted to specific local conditions.

Output Achieved:

A Patent was awarded to CIAT (No. 17204 of June 29, Superintendencia de Industria y Comercio de Colombia) and the partner institution BIOTEC for the methodology for clonal propagation of soursop, using micro-grafting techniques. Currently, clonal propagation of soursop using micro-grafting technologies is commercially used by a local nursery industry in Colombia. The main use though, is for generating clean planting material for mother trees, from which regular grafting technologies are being implemented.

Activities on soursop has ceased due to lack of funding, but same principles and approaches are being implemented in other woody perennial species (Avocado: *Persea americana*), and semiperennial Andean species (Lulo: *Solanum quitoense* and Andean Raspberry, *Rubus glaucus*). In the propagation of Avocado, research is in progress to promote rooting of old tissue (a bottleneck) which would facilitate developing clones from trees grafted on unknown rootstocks that perform well under serious phytosanitary threats like root rot (*phytophthora cinnamomi*), the most limiting disease in avocados.

3. Research Highlights 2006.

3.1. Lixiviates from decomposing plantain rachises and pseudostems contain bacteria that are useful for releasing nutrients and for acting as possible antagonists of pathogens and do not contain the pathogenic bacteria *Ralstonia solanacearum*.

Plantain rachis accounts for large biomass left out in the plantain farms, as in some cities authorities are dealing with policies that restrict the entrance of full plantain bunches to the wholesale food market. Growers are decomposing the rachis and produce lixivate as a way of dealing with the organic waste. The decomposing rachis produce a lixivate that has been associated with disease control properties, and is currently used by growers as fertilizer as well. The risk of propagating the disease cause by *R. solanacearum* was assessed by looking for the presence of bacteria and inoculating plantlets with lixivate and inoculum of *R. solanacearum*. Assessment of the composition of microorganisms in the lixivate indicated that *Escherichia coli* or *Salmonella* spp., or *R. solanacearum* were not found in plantain compost. Through biochemical tests, we identified *Pseudomonas* bacteria, which are ecologically important microorganisms found in the soil and probably responsible for the degradation of many soluble compounds that derive from the monomeric rupture of plant materials in oxygenated habitats. These organisms are typically aerobic and contribute to the decomposition and discharge of nutrients, attacking the organic substrate, including humic acids and synthetic pesticides. *Proteus* bacteria were found because they live in soils, residual waters, and manure. Further nutritional test indicate large amounts of K and Mn were found in the lixivate, and as expected, concentration of these nutrients were affected by the place of origin of the plant material. Increase in bunc size and productivity claimed by growers that use the lixivate as either foliar fertilizer or as a drench could then be explained by level of nutrients being added to the crop and because of the presence of beneficial bacteria. There is not risk of propagating the disease when using lixivate from plantain rachis.

3.2. High level of Benzyl Amino Purine (BAP 250 mg/l) induce shoot regrowth from old avocado rootstocks.

Avocado is seriously affected by root rot, a soil borne disease caused by *Phytophthora cinnamomi*. This pseudo-fungus is the most limiting problem in avocados around the world. Once trees get infected with the disease, trees within a short time and farms where disease occurred are reluctantly abandoned for avocado growing activities. The solution to this problem is to find rootstocks with tolerance to the disease. Such rootstocks are not known for tropical conditions. Avocado farms in many developing countries are either growing native landraces of seed propagated trees, or trees of known varieties grafted on unknown rootstocks. Those rootstocks originated from seedlings produced by seeds, and consequently there is huge genetic variation in rootstocks of the existing farms. Occasionally, within a farm infected by *Phytophthora* a few trees survive, because they escaped the pathogen or because the rootstock have some level of genetic resistance to the disease. To recover the rootstock one could detop the tree (remove the canopy) and induce regrowth from the rootstock. This treatment is not welcome by growers and an alternative method to rescue the rootstock was needed. So far, literature reports were very discouraging of the success of inducing regrowth from woody tissue. By applying high levels of Benzyl Amino Purine (BAP 250 mg/l) through a cut in the bark below the grafting point of avocado tree, we were able to rescue rootstocks from 20

to 30 year old avocado trees. Further experimentation is underway to refine the hormone concentration to increase level of shoot induction.

4. Publications - IPO6

Refereed Journals

Alvarez, E., Mejia, J.F. 2006. DNA Sequence Analysis of the 16Sr RNA region of Phytoplasma associated with lethal wilt in oil palm. *Fitopatología Colombiana* 29(1):39-44

Galvis, C.A., Leguisamón, J.E., Gaitán, A.L., Mejía, J.F. , Alvarez, E. 2007. Detection and Identification of a Group 16SrIII Related Phytoplasma Associated with Coffee Crispiness Disease in Colombia. *Plant Disease* 91(3): 248-252.

Grossman YL., **González A.**, Pavel EW 2006. Modelling Mango Fruit and Vegetative Growth.. Proc VII International Symposium on Modelling in Fruit Research. *Acta Hort* 707, *ISHS* 33-40.

Abstracts and Proceedings

Alvarez, E. 2006. DNA sequence analysis of the 16s rRNA region of phytoplasma associated with lethal wilt in oil palm. International Oil Palm Conference. Nusa Dua-Bali, Indonesia. June 19 -23, 2006 .

Alvarez, E., Mejia, J.F., Gómez, E. 2006. Diseño y estandarización de una sonda TaqMan para la detección específica de *Ralstonia solanacearum* Raza 2, en plátano mediante PCR en tiempo real. Memorias XLVI Annual Meeting American Phytopathology Society (APS) Caribbean Division, XXVII Congreso de ASCOLFI (Asociación Colombiana de Fitopatología), Annual Meeting III URNG Internacional Phytopathology Workshop.

Papers Presented

Alvarez, E. 2006. DNA sequence analysis of the 16s rRNA region of phytoplasma associated with lethal wilt in oil palm. International Oil Palm Conference. Nusa Dua-Bali, Indonesia. June 19 -23, 2006.

Alvarez, E., Mejia, J.F., Gómez, E. 2006. Diseño y estandarización de una sonda TaqMan para la detección específica de *Ralstonia solanacearum* Raza 2, en plátano mediante PCR en tiempo real. Memorias XLVI Annual Meeting American Phytopathology Society (APS) Caribbean Division, XXVII Congreso de ASCOLFI

(Asociación Colombiana de Fitopatología), Annual Meeting III URNG Internacional Phytopathology Workshop.

Alvarez, E. 2006. Avances en el manejo de la enfermedad del moko en Colombia. Foro Internacional sobre Innovaciones y Alianzas para el Desarrollo del Cultivo de Plátano. CIAT, Palmira, Colombia, 6 de diciembre.

Alvarez, E. 2006. Caracterización genética e inducción de resistencia a *Sphaerotheca pannosa*, agente causal de mildew polvoso. Foro de Innovación: Tecnologías para la Eficiencia, Asocolflores – Ceniflores, Bogotá, Colombia, mayo 24 – 25.

González, A. 2006 Frutas Tropicales en el Mundo. Diversidad, Uso Actual y Crecimiento de Mercados. 1st Congreso Colombiano de Ciencias Hortícolas. Bogotá, Octubre 18 2006. (*Memorias 1er Congreso Colombiano de Horticultura. ISBN 958-701-744-7*).

González, A. Peters M. 2006 Exploring Diversity to benefit Small Holders. Meeting to develop a CGIAR strategy and Action Plan of Forest and Tree Genetic Resources. Rome Sept 18-20, 2006.

González, A. 2006 Tropical Fruits. Bringing the Benefits to Small Holders. Boa Vista, Brazil. Sept, 2006 (Workshop on Conservation and Use of Amazon Fruits).

Books and monographs

Diana Alvarez, James Cock, Germán Llano, Norbey Marín, Luis Armando Muñoz, Alberto Rojas, Jaiver Danilo Sánchez, Myriam Sánchez. 2006. Guía para registro de información en frutales. Lulo. Colciencias, Acción Social, Ministerio de Agricultura y Desarrollo Rural, Escuela de Ingenieros del Cantón de Vaúd (Suiza), CIAT, Asocaña, Cenicaña, SAG. 32 PP. ISSN: 1909-5368

Diana Alvarez, James Cock, Germán Llano, Norbey Marín, Luis Armando Muñoz, Alberto Rojas, Javier Danilo Sánchez, Myriam Sánchez. 2006. Guía para registro de información en frutales. Mora. Colciencias, Acción Social, Ministerio de Agricultura y Desarrollo Rural, Escuela de Ingenieros del Cantón de Vaúd (Suiza), CIAT, Asocaña, Cenicaña, SAG. 36 PP. ISSN: 1909-5368.

5. List of proposals funded in 2006.

Project Proposals and CN Submitted – 2006 IPO6

Donor/Title	Lead Researcher/ Principal Contact	Total Budget US\$
FONTAGRO Strengthening value chain of plantain: technology innovations for agrochemical reductions	Elizabeth Alvarez Approved Sept 2006	300,000
FONTAGRO Enhancing competitiveness of smallholder growers of Lulo and Mora through participatory selection of elite clones, integrated crop management and strengthening of value chains	Alonso González Approved Oct 2006	486,000
SENA –BPA Implementing Good Agricultural Practices for production of Plantain for international markets	Elizabeth Alvarez Approved Dec 2006	COP\$ 556,875,500
Asohofrucol Proposal for developing a Documentation and Information Center on Tropical Fruits to help the Colombian Fruit Sector	Alonso González Approved. March 2006	COP\$ 23.300.000
MADR Strengthening of andean blackberry value chain through integrated pest management and elite clones	Elizabeth Alvarez Rejected	337,952
MADR Technological innovations to reduce agrochemical use in production of Plantain	Elizabeth Alvarez Rejected	260,870
Federal Ministry of Finance (BMF)-Austria Improving fruit and vegetable product quality from smallholder systems: Optimizing soil-crop-pest management for economically viable, socially acceptable and ecologically sustainable production	Alonso González, Tomas Oberthur; Mark Lundy Rejected	709.000 Euros
Gates Foundation. Use of Technologies and Agents of Innovation for Rural Agroindustry to enhance competitiveness of Andean Fruit Small Farmers	Alonso González Shaun Ferris. Rejected.	US\$1'500.000
MADR Viral and fungal disease management strategies. Use of elite clones, horticultural practices and biofungicides in andean blackberry and passionfruit	Alonso González Rejected	COP\$ 1.204'.519.000

Donor/Title	Lead Researcher/ Principal Contact	Total Budget US\$
Submitted proposals, not yet approved		
Asohofrucol Implementing Good Agricultural Practices for production of Plantain for international markets, fresh consumption and processing	Elizabeth Alvarez	COP\$242,120
Asohofrucol Documentation and Information Center for Tropical Fruits.	Alonso González	US\$570,000

List of ongoing special projects in 2006 – IP06

Project Title	Donor	Participating Institutions	Amount available in 2006 US\$		Total project budget US\$
			CIAT (lead scientist)	Participating Institution (lead scientist)	
Precision agriculture and construction of models for tropical fruit crops (2005 – 2007)	COLCIENCIAS Agencia Colombiana de Cooperación Internacional (ACCI) MADR Colombia	Corporación BIOTEC	Alonso González Elizabeth Álvarez	Myriam Sánchez	425,564 (CIAT: 25,000)
Added value lulo. Alternatives for small growers (2006 – 2008).	Ministry of Agriculture and Rural Development (MADR), Colombia	CORPOICA La Selva, Universidad de Antioquia	Alonso Gonzalez, Zaida Lentini, Elizabeth Alvarez	Mario Lobo	313,734 (CIAT: 153,000)
Integrated Water resource management by the implementation of improved Agro- Forestry concepts in arid and semi-arid areas in Latin America- WAFLA (Oct 2006- Mar 2009)	Sixth Framework-European Communitiy	TTZ (leading institutions) CIAT + 21 partners from Latin America and Europe	Alonso González Carlos Ostertag Jorge Beltrán	TTZ	Euros, 1'350.000.00 CIAT (80,000).

Capacity building and development of management strategies of Moko Disease (<i>Ralstonia solanacearum</i>) in Plantain in Armenia, Colombia.	Alcaldía de Armenia, Quindío, Colombia	Fedeplátano	Elizabeth Alvarez	Silverio González	5,217 (CIAT 5217)
Collection, characterization, and clonal multiplication of avocado with emphasis on identification of lines tolerant to <i>Phytophthora</i> spp. (2006-2008)	Ministry of Agriculture and Rural Development (MADR), Colombia	CORPOICA, PROFRUTALES	Alonso González Alvaro Mejia, Joe Tohme Elizabeth Alvarez	Juan Jaramillo, Danilo Rios	411,580 (CIAT: 97,000)

6. Problems Encountered and Their Solution.

Financial problems and lack of clear direction for where the Center is going is affecting the performance of staff, both international and national. Financial crisis developed at the end of 2005 and at the end of 2006 again. This is an ongoing problem that the staff from IP-06 do not have control upon. Lack of financial security is jeopardizing the potential impact that a Tropical Fruits Project could have within the CG system. Permanent effort on acquiring funding does not permit the development of long term research.

7. Staff list (indicate % time assignment)

Alonso González, Leader, 100%
Elizabeth Alvarez, Pathologist, 25%
Zaida Lentini, Biotechnologist, 10%.

8. List of Partners/Collaborators

Colombia

Adriana Arenas, Universidad del Valle
Carlos Aníbal Montoya, ICA
Henry Toro, Universidad de Caldas
Hover Naranjo, farmer from Quindío
Instituto Colombiano Agropecuario (ICA), Quindío and Valle
Jairo Castaño, Universidad de Caldas
Jorge E. Angel, Profrutales Ltda.
Luz Adriana Meza, Universidad del Quindío
Marcelo Vargas, Universidad de Caldas
Mario Lobo, CORPOICA La Selva
Myriam Sánchez, Corporación BIOTEC
Omar Zuluaga, Universidad de Caldas
Silverio González, FEDEPLATANO
Universidad Católica de Manizales
Victor Hugo Treviño, Universidad del Quindío
Jesús Zuleta, Universidad de Santa Rosa de Cabal
Consuelo Montes, Universidad del Cauca
Tulio Cesar Lagos, Universidad de Nariño
Jesús Castillo, Universidad de Nariño
José Ricardo Cure, Universidad Militar Nueva Granada

Ecuador

Escuela Politécnica del Ejército (ESPE)
Wilson Vasquez, INIAP

France

Thierry Lescott, CIRAD
Philippe Prior, INRA
Fabrice Villaint, CIRAD

United States

Ron Walcott, University of Georgia

9. Summary budget.

ACTUAL EXPENDITURES 2006

PROJECT IP6: Tropical Fruits

SOURCE	AMOUNT US\$	PROPORTION (%)
Unrestricted Core	192,401	59%
Restricted Core		0%
		0%
Sub-total	192,401	59%
Special Projects	131,105	41%
Total Project	323,506	100%