

**SUMMARY ANNUAL REPORT 2006**  
**PROJECT *IP-06***

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



**SUMMARY ANNUAL REPORT 2006**  
**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)**

	<b>Outputs</b>	<b>Intended User</b>	<b>Outcome</b>	<b>Impact</b>
<b>OUTPUT 1</b>	Interactive Web-based information system in place to determine which tropical fruits can grow successfully in a given place: <i>Homologue-What to Grow Where.</i>	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
<b>Output Targets 2006</b>	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	
<b>Output Targets 2008</b>	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	

<b>OUTPUT 2</b>	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 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. Lixivates from decomposing plantain rachises is free of the pathogenic bacteria *Ralstonia solanacearum*, contains useful bacteria for nutrient release and for acting**

**as possible pathogen antagonist.** Plantain growers are composting the rachises and a lixiviate is produced, which has been associated with disease control properties, and is currently used as fertilizer. Because some rachises come from diseased plants, the risk of propagating pathogen *R. solanacearum* was assessed by looking for the presence of bacteria and inoculating plantlets with lixiviate and inoculum of *R. solanacearum*. Assessment of the microorganisms in the lixiviate indicated that *Escherichia coli* or *Salmonella* spp., or *R. solanacearum* were not found in plantain compost. We found *Pseudomonas* spp an ecologically important soil microorganism, probably responsible for the degradation of many soluble compounds that derive from the monomeric rupture of plant materials in oxygenated habitats, contribute to the decomposition of organic waste, discharge of nutrients, and breakdown of synthetic pesticides. Large amounts of K and Mn were found in the lixiviate. Mn participates in the defense mechanism of the plants, and K is an essential element highly correlated with fruit size. There is not risk of propagating the disease when using lixiviate from plantain rachis.

**3.2. Benzyl Amino Purine (BAP 250 mg/l) induces shoot regrowth from old avocado rootstocks.** Avocado is seriously affected by root rot, a disease caused by *Phytophthora cinnamomi*. This pseudo-fungus is the most limiting problem in avocados around the world, and forces growers to abandon their crops. Rootstocks tolerant to the disease in the tropics offer a solution. Avocado farms in many developing countries are either growing native landraces of seed propagated trees, or trees of known varieties grafted on unknown rootstocks. Occasionally, within a farm infected by *Phytophthora* a few trees survive, suggesting that trees escaped the pathogen or that the rootstock have some level of resistance to the disease. To recover the rootstock one could remove the canopy and induce regrowth from the rootstock, but this is not welcome by growers. By applying high levels of Benzyl Amino Purine through a cut in the bark below the grafting point of avocado tree, one could 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, and to test the technique on other woody species.

#### **4. Project Outcome**

Propagation of clean planting material through tissue culture techniques has been slowly adopted by local commercial nurseries in developing countries. However, due to high cost of producing the plantlets, and due to low volume of sales in some species (i.e soursoap), the approach is being used mainly to propagate healthy and safe mother trees from where clean budwood is produced for traditional grafting commercially important varieties. It was found that local agencies in charge of regulating phytosanitary issues must enforce regulations related to movement of safe planting material for adoption to be enhanced. To reach that level of technological development, a market willing to pay for clean planting material should be developed. In many tropical fruits that development is still very incipient.

Principles and approaches are currently being implemented in other woody perennial species (Avocado: *Persea americana*), and semiperennial Andean species (Lulo: *Solanum quitoense* and Andean Raspberry, *Rubus glaucus*), which are in high demand in areas where activities are being carried out.

## **5. 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.

**6. List of proposals funded in 2006.**

**Project Proposals and CN Submitted – 2006  
IPO6**

<b>Donor/Title</b>	<b>Lead Researcher/ Principal Contact</b>	<b>Total Budget US\$</b>
<b>FONTAGRO</b> Strengthening value chain of plantain: technology innovations for agrochemical reductions	Elizabeth Alvarez Approved Sept 2006	300,000
<b>FONTAGRO</b> 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
<b>SENA –BPA</b> Implementing Good Agricultural Practices for production of Plantain for international markets	Elizabeth Alvarez Approved Dec 2006	COP\$ 556,875,500
<b>Asohofrucol</b> 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
<b>MADR</b> Strengthening of andean blackberry value chain through integrated pest management and elite clones	Elizabeth Alvarez Rejected	337,952
<b>MADR</b> Technological innovations to reduce agrochemical use in production of Plantain	Elizabeth Alvarez Rejected	260,870
<b>Federal Ministry of Finance (BMF)-Austria</b> 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
<b>Gates Foundation.</b> 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
<b>MADR</b> 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

<b>Donor/Title</b>	<b>Lead Researcher/ Principal Contact</b>	<b>Total Budget US\$</b>
<b>Submitted proposals, not yet approved</b>		
<b>Asohofrucol</b> Implementing Good Agricultural Practices for production of Plantain for international markets, fresh consumption and processing	Elizabeth Alvarez	COP\$242,120
<b>Asohofrucol</b> 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 Community	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)

### ***7. 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.

### ***8. Staff list (indicate % time assignment)***

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

### ***9. 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

## *10. Summary budget.*

### ACTUAL EXPENDITURES 2006

#### PROJECT IP6: Tropical Fruits

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