Panorama of the Banana Industry in Latin America and the Caribbean Islands

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Director General

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Research Scientist
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- Introduction
- Socio-Economic Aspects
- Environmental Aspects
- Present Challenges
- R&D efforts and results
- Final Comments
Introduction

- Welcome to Brazil – Bahia – Salvador

- Banana → Fruit, yes (source of minerals, vitamins and other principles essential for health, but in small amounts)

  → Staple food, in many regions, yes (it is the 4th most consumed food, source of carbohydrates, energy; large consumption; omnipresence in tropical and even subtropical regions; convenient for fresh eating, and Easy to Grow !?…)

  → Many other uses (large biomass → mixed cropping systems; ornamental; fiber → handcraft etc.)
➢ The most important fruit in the world, and so it is in Brazil and Latin America

➢ Deserves all attention and efforts: R&D, TT, Production, Marketing, Post-harvest handling

➢ Pro Musa 2011 = inserted into these global efforts, with strong participation of LA and BR

➢ Lets have a look on some of those efforts...
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Banana Production by Continents

Production (t)

<table>
<thead>
<tr>
<th>Continent</th>
<th>Area Harv (ha)</th>
<th>Production (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>4.923.584</td>
<td>97.378.272</td>
</tr>
<tr>
<td>Americas</td>
<td>15.2</td>
<td>19.7</td>
</tr>
<tr>
<td>Europe</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td>Africa</td>
<td>34.5</td>
<td></td>
</tr>
</tbody>
</table>

Yield (t/ha)

<table>
<thead>
<tr>
<th>Continent</th>
<th>Yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>34.5</td>
</tr>
<tr>
<td>Americas</td>
<td>28.3</td>
</tr>
<tr>
<td>Oceania</td>
<td>19.7</td>
</tr>
<tr>
<td>Europe</td>
<td>15.2</td>
</tr>
<tr>
<td>Africa</td>
<td>7.1</td>
</tr>
</tbody>
</table>
Banana – Main countries of production

Production (million tons)

Area (1000 ha)
Banana (Production in Latin America)

Volume (t)

Year

Brasil
Equador
Costa Rica
México
Colombia
Guatemala
Honduras
Venezuela

Volume (t)

Main Banana Exporting Countries in Latin America
(Volume exported in millions of boxes)

>30% of world exports
Main Banana Exporting Countries in Latin America
(Yield in boxes per ha)

- ECUADOR
- COLOMBIA
- COSTA RICA

Sección de Estadística, CORBANA
Costa Rica

- 43500 ha / 2542 boxes/ha
- 100 millions of boxes / 659 mill. of USD$
- 40,000 direct jobs / 100,000 indirect jobs

- Relatively small total area, but high investments in technology, focused on exportation

99% of fields have at least one certification:

<table>
<thead>
<tr>
<th>Certification</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLOBAL-GAP</td>
<td>98%</td>
</tr>
<tr>
<td>ISO-14001</td>
<td>53%</td>
</tr>
<tr>
<td>SA-8000</td>
<td>41%</td>
</tr>
<tr>
<td>Rain Forest A.</td>
<td>28%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
</tr>
</tbody>
</table>
Exports of Plantain – Main Destinations
Banana in Brazil

7 million t / 513,000 ha
(FAO 2010)

11.98%
37.28%
14.38%
3.47%
32.88%

Area harvested (x1000 ha)

Yield (t/ha)
Banana in Brazil

Main States of Production - 2009
**Banana in Brazil**

- Is the most consumed fruit, together with oranges, and fundamental for the complementation of the diet of the poorer population
- Internal consumption - 65-70% of production
- Exports – 2-5%
- Post-harvest losses - 30%
- Number of growers: 63 thousand
- More than 500 thousand direct jobs
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Climatic diversity in main banana regions of Brazil

- North Bahia, West Pernambuco Semiarid (500mm) tropical (26.5°C), 4000ha, 1% nat. prod.
- South Bahia, wet (1500mm) tropical (25°C) 10000 ha, 2% nat. prod.
- North Minas Gerais, tropical (23°C) Milder Semiarid (1000mm), higher (>500m) 6500 ha, 2% nat. prod.
- Southeast São Paulo, Ribeira Valley, Subtropical (24°C, 13-35), wet (1500mm) 30000 ha, 7% nat.prod.
- Northeast Santa Catarina, cooler subtropical (22°C, 11-35), wet (2000mm);12500 ha, 6% nat. prod.

<table>
<thead>
<tr>
<th>States</th>
<th>Área Harvested (ha)</th>
<th>Production (t)</th>
<th>Yield (t/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahia</td>
<td>65.487</td>
<td>1.015.505</td>
<td>15,51</td>
</tr>
<tr>
<td>Minas Gerais</td>
<td>39.194</td>
<td>620.931</td>
<td>15,84</td>
</tr>
<tr>
<td>Santa Catarina</td>
<td>30.922</td>
<td>624.204</td>
<td>20,19</td>
</tr>
<tr>
<td>São Paulo</td>
<td>53.078</td>
<td>1.257.539</td>
<td>23,69</td>
</tr>
</tbody>
</table>
Possible impacts of climatic changes ex. Bahia

- Scenarios
  - A2 – the more pessimist one, which estimates an increase of temperature by 2°C to 5.4°C until 2100;
  - B2 – the more optimist one, which estimates an increase of temperature by 1.4°C to 3.8°C until 2100.

- These projections were done by using the model Precis (Providing Regional Climates for Impact Studies)
Maps of aptitude for banana cultivation in Bahia, Brazil - scenario B2

In blue – reduction of area for banana cultivation due to climatic changes (higher T, lower rainfall)
Climatic changes and favorability of the occurrence of *Cosmopolites sordidus* in Bahia - Brazil

In the present scenario, *C. sordidus* completes from 5.38 to 6.86 generations/year

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Generations/year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2020</td>
</tr>
<tr>
<td>A2</td>
<td>5.78 to 7.48</td>
</tr>
<tr>
<td>B2</td>
<td>5.73 to 7.41</td>
</tr>
</tbody>
</table>

Higher T → Shorter reproductive cycle
Climatic changes and favorability of occurrence of Black Sigatoka in Bahia - Brazil

In red – reduction of areas with risk for incidence
Lower rainfalls, lower humidity → lower risk
Excess of rainfall in Costa Rica – banana plantations under water

Source: Corbana, Costa Rica

Bocas Farm
Storm damages in Banana plantations in Costa Rica

Source: Corbana, Costa Rica
Climatic Changes vs. Banana
What should be done?

• Develop global models for prediction of the climatic changes
• Intensify studies of impacts on the geographical distribution of pests and diseases
• Prospection, selection, development and evaluation of new genotypes with tolerance/resistance to the main abiotic and biotic stresses imposed by the climatic changes
• Selection of ecotypes of local cultivars with possible potential of better adaptation to the new climatic conditions
• Intensify the use of green soil covers to reduce water loss and soil erosion
• Moving harvests towards periods of more favorable climatic conditions
Example of service crucial towards planning prevention of negative impacts of climatic changes
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▪ Introduction

▪ Socio-Economic Aspects

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▪ Main challenges

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▪ Final Comments
Challenges

BRAZIL

Disease/Pests: Panamá disease, Yellow and Black Sigatoka, Moko bacteriositis, Nematodes, banana weevil and viroses

Low Yields: - Brazil 14 t/ha (with large variation)

  - India 36 t/ha

Plant Height: most of the cultivars are tall

Harvest and Post-harvest: High Losses (30%)
Black Sigatoka in Brazil
Main limiting factors of the Banana Industry in Ecuador

Pests and Diseases:

- Black Sigatoka (Mycosphaerella fijiensis)
- Nematodes (Radopholus similis, Pratylenchus spp., Meloidogyne spp., Helicotylenchus),
- Mealybugs, vectors of BSV
- White Fly (Aleurotrixus floccosus),
- Trips (Frankliniella parvula y F. brevicaulis)
- Some are of occasional presence, more localized and appear in cycles

Source: Sotomayor, I., Ecuador
Main limiting factors of the Banana Industry in Peru

Only 50 – 100 fingers among 150 fingers attend export requirements (4 to 7 hands in a potential of 9 hands):

- Quality of planting material
- Diseases as, for example, BSV
- Pests as, for example, “mancha roja” (red spot)
- Old decadent fields
- Lack of genetic uniformity
- Deficient water and nutrient supplies
- Climatic constraints at harvest (cold)
- Deficient TT and adoption of technologies
- Deficient organizations of producers

Source: Aguilar, C., INIA, Peru)
Social and environmental challenges in general

- **Food security, Climatic Changes**

- **Availability of genetic material with superior qualities demanded by the markets**

- **Risks to human health due to excessive use of chemical inputs in general, mainly pesticides**

**Investments in Use of Genetic Resources, Breeding and Improvement of Crop and Post-harvest Management with minimization or elimination of use of aggressive chemicals, higher respect to environmental and human issues, without loosing or even gaining in economic returns on a short and long term bases.**
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Main Institutions doing R&D of Banana in Latin America

Central America:

Mexico
Instituto Nacional de Investigaciones Forestales y Agropecuarias (INIFAP)

Honduras
Fundación Hondureña de Investigación Agrícola (FHIA)

Costa Rica
Corporación Bananera Nacional S.A. (CORBANA)
Centro Agronómico Tropical de Investigación y Enseñanza (CATIE)
Bioversity International (Bioversity)

Nicaragua
Universidad Nacional Autónoma de Nicaragua (UNAN)

Panama
Instituto de Investigaciones Agropecuarias de Panamá (IDIAP)
Main Institutions doing R&D of Banana in Latin America

Caribbean Islands

Guadeloupe and Martinica
Centre de coopération internationale en recherche agronomique pour le développement (CIRAD)

Cuba
Instituto Nacional de Frutales Tropicales (INFT)

Dominican Republic
Instituto Dominicano de Investigaciones Agrícolas y Forestales (IDIAF)

Puerto Rico
Universidad de Puerto Rico (UPR)
Main Institutions doing R&D of Banana in Latin America

South America

Colombia
Corporación Colombiana de Investigación Agropecuaria (CORPOICA)
Centro Internacional de Agricultura Tropical (CIAT)

Venezuela
Instituto Nacional de Investigaciones Agrícolas (INIA)

Ecuador
Instituto Nacional de Investigaciones Agropecuarias (INIAP)

Peru
Instituto Nacional de Investigación Agraria (INIA)

Argentina
Instituto Nacional de Tecnologia Agricola (INTA)
Main Institutions doing R&D of Banana in Latin America

Brazil

Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA)
www.embrapa.br

Empresa de Pesquisa e Extensão Rural de Santa Catarina S.A. (EPAGRI)

Instituto Agronômico de Campinas (IAC), São Paulo

And others (state research organizations, universities)
MUSALAC network (www.bioversityinternational.org)

(Plantain and Banana Research and Development Network for Latin America and the Caribbean)

• Established in 1987
• Operates under the auspices of the Foro Regional de Investigación y Desarrollo Tecnológico Agropecuario para America Latina y el Caribe (FORAGRO www.fontagro.org)).

• Its general objective is to increase productivity and competitiveness of the plantain and banana agroalimentary chain by developing scientific and technological activities; strengthening national research and development systems; and prioritizing and coordinating actions in Latin America and the Caribbean Region
MUSALAC network (www.bioversityinternational.org)

- It has about 20 institution as members from 18 countries
- It has a regional direction (present director is Dr. Mario Orozco, INIFAP, Mexico)
- Its main home location is the regional office of Bioversity International, Turrialba, Costa Rica (Coordinator: Dr. Miguel Dita)
Brazilian Agricultural Research Corporation

Foundation - 1973
47 Units all over the country
> 2300 researchers and about 9500 people working on themes, products and ecosystems of strategic importance in agriculture, livestock, agroindustry, agroenergy and environment

Embrapa Cassava & Fruits
36 years of activities

- A wide network of International Cooperation, including the Virtual Foreign Laboratories -- Labex
  - North America – USA
  - Europe – France, England
  - Asia – South Korea and China (in implantation)
  - Technical Cooperation: Ghana (Africa), Panama and Venezuela (Latin America)
Embrapa Cassava & Fruits, Cruz das Almas, Bahia, Brazil
Main Crops Studied
Embrapa Cassava & Fruits - Basic Infrastructure

- Experimental fields (> 100ha)

- 14 laboratories
  - plant health – 4 (pathology, entomology, nematology, virology),
  - biotechnology – 2 (molecular biology, micropropagation),
  - soil sciences – 3 (chemistry, physics, microbiology),
  - water management, plant physiology, cultural practices
  - seed technology, food technology

- 5 glasshouses, 26 screenhouses
- Cassava Tech Transfer Center
- Center for production of basic planting material
- Biofactory (in vitro production of banana and pineapple plantlets)

- Library and other facilities
Under construction – Nucleus of Advanced Biology
Partial views from “above” Embrapa Cassava & Fruits, Cruz das Almas, BA
Embrapa Cassava & Fruits Advanced Camps

Headquarters

- **Active Camps**
- **Camps to be implanted**
Embrapa Cassava & Fruits – International Cooperation
Countries and Actions – R&D (red) and TT (blue) - 2010
Embrapa Cassava & Fruits
Main Research Areas

• Genetic Resources and Breeding
• Advanced Biology
• Plant Health
  (Pathology, Virology, Entomology, Nematology, Biological Control)
• Sustainable Use of Natural Resources
  (Soil and Water Management)
• Sustainable Production Systems
  (Integrated Production, Organic Production)
• Post-harvest handling and processing
• Innovation Management
  (Social and economic systems, TT, tech prospection, tech adoption and impact evaluation)
Embrapa breeding program

Germplasm bank

• Since 1984
• Kenneth Shepherd
• Accessions from all over the world
Embrapa Cassava & Fruits - Genetic improvement - Main objectives

**Resistance to biotic stresses**
- Black and Yellow Sigatoka, Panamá disease
- Banana weevil and nematodes

**Agronomic characteristics and post-harvest quality**
- Plant height
- Yield
- Fruit flavor
- Fruit abscision

**Ornamental**
- Gardening
- Cut flowers
- Pot plants
- Minifruits

**Nutritional proprieties**
- Functional attributes: vitamins, antioxidants etc
Some cultivars released by Embrapa

- Pacovan Ken (PV42-68)
- Preciosa (PV42-85)
- Vitória (PV42-81)
- Japira (PV42-142)

All with resistance to BS, YS and PD
Some more cultivars released by Embrapa

- **Caprichosa** (PC42-01)
- **Garantida** (ST42-08)
- **Tropical** (YB42-21)

With resistance to BS, YS and PD

YS: RESISTENT
BS: SUSCEPTIBLE
PD: RESISTENT
Embrapa - Biotechnology supporting genetic improvement of banana

- Molecular biology
- Induction of mutation
- Duplication of chromosomes
- Somatic hybridization
- Fertilization in vitro
- Genetic engineering
Other relevant advances

Reduction and efficiency increase of inputs used:

• **Integrated banana production** (adequate cultivars, improved soil management, biological control of the weevil, monitoring of pests and diseases to direct control, less pesticides, fungicides, herbicides, rational use of water and fertilizers, safer production, safer products, long term conservation of natural resources)

• Organic production

• Banana integrating mixed cropping systems (banana – cacau, rubber – banana – cacau etc)

• And many other advances to be seen in the presentations of this ProMusa 2011
CORBANA HAS ESTABLISHED THE GOAL TO DEVELOP ALTERNATIVES TO HELP REDUCE SYNTHETIC PESTICIDE USE BY 50% WITHIN 10 YEARS

COOPERATION: U. DE WAGENINGEN (HOL), U. CATÓLICA OF LOVAIN (BEL), CIRAD (FRA), EMBRAPA (BRA), CORBANA (CR)

International Pesticide Reduction Plan for Banana PRPB meeting
November 20–22, 2007, Costa Rica
Equador

INIA

Manejo ORGÁNICO-BIOLÓGICO
Para el CONTROL DE
NEMÁTODOS EN BANANERA
ORGÁNICA DE "LOS RÍOS"

26/01/2011
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Consumers expect:

To get bananas and plantains of better nutritional quality and safer and to have a offer of more varieties at convenient prices
Growers expect:

To obtain bananas at lower economic and environmental costs, hence to get higher yields with less use of aggressive chemicals and wider application of biological and cultural pest and disease control measures.

And to meet consumers general requirements mentioned before.

All this spiced by already occurring and further expected climatic changes!!
Hence, there is a whole range of challenges for all involved in the banana and plantain food production chains and especially for all R&D institutions!
How to overcome these challenges?

- First of all by working together in a more and more integrated way:
  - The ProMusa and Musalac networks are steps in that direction
  - R&D networks established by Embrapa within its National R&D Management Programs and in its international cooperation strategy are also good examples in the correct direction
How to overcome these challenges (cont.)?

- By more intense and efficient interinstitutional cooperation
- By sharing problems and especially efforts towards solutions
- And by sharing knowledge and results in an efficient and transparent way:

ProMusa 2011 is certainly a great opportunity to do so!

Welcome to Salvador, Bahia!!
Thanks for your attention!

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