GRAIN, FIBBER AND FRUIT PRODUCTION IN THE CERRADO DEVELOPMENT

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CERRADO

30 to 80% of Soybean, Cotton, Maize, Phaseolus Beans, Sorghum, Sunflower, Pineapple and Passion Fruit National Production

Just to mention the, presently, outstanding crops

Technology

High Profitable Yields
Traditional Zone *versus* Cerrado: Main Conditioners

- Topography
  - Slopes
  - Rainfall Distributed
- Temperature Limiting in winter
- Soils Low-Medium CEC
- Infrastructure Suitable
- Distance (Sea port, Industry) Short to Medium

<table>
<thead>
<tr>
<th>Conditioners</th>
<th>Traditional Zone</th>
<th>Cerrado</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immense Plateaux</td>
<td>Slopes</td>
<td>Immense Plateaux</td>
</tr>
<tr>
<td>Concentrated</td>
<td>Rainfall</td>
<td>Concentrated</td>
</tr>
<tr>
<td>Favourable all year</td>
<td>Temperature</td>
<td>Favourable all year</td>
</tr>
<tr>
<td>Very Low CEC</td>
<td>Soils Low-Medium CEC</td>
<td>Very Low CEC</td>
</tr>
<tr>
<td>Deficient</td>
<td>Infrastructure</td>
<td>Deficient</td>
</tr>
<tr>
<td>Long</td>
<td>Distance (Sea port, Industry)</td>
<td>Long</td>
</tr>
</tbody>
</table>
CLIMATE

PPT: 1570 mm (1200 - 1800)
ETP: 1280 mm
T: 21.3°C (17 - 27°C)
## SOIL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Area</th>
<th>Physical</th>
<th>Chemical $^b$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sand</td>
<td>Silt</td>
</tr>
<tr>
<td></td>
<td>g dm$^{-3}$</td>
<td>cmol c+</td>
</tr>
<tr>
<td>Virgin</td>
<td>340</td>
<td>190</td>
</tr>
<tr>
<td>Amended$^2$</td>
<td>5.6</td>
<td>0.0</td>
</tr>
</tbody>
</table>

$^a$ OM=Organic Matter; $^b$ 4.0 t ha$^{-1}$ lime, 240 kg ha$^{-1}$ P$_2$O$_5$. 
In virgin savannah land there are up to 300 species ha\(^{-1}\)
CERRADO EXPLOITATION
THE PAST
Until the early 1970`s

- Low Input Rice and Pasture Associated Cropping
- Domestic Fruit Culture - Tropical and Native
- Cotton, Beans and Maize in Patches of Naturally Fertile Soils
THE 30 YEARS OF SILENT REVOLUTION
Evolution of average yields (t ha\(^{-1}\)) for major crops, from 1975 to 2005, related to the potential identified by research

<table>
<thead>
<tr>
<th>Crop(^1)</th>
<th>Average Yield</th>
<th>Increase Rate (1975-2005)</th>
<th>Potential Yield(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1975</td>
<td>1993</td>
<td>2005</td>
</tr>
<tr>
<td>Soybean</td>
<td>1.32</td>
<td>2.20</td>
<td>2.81</td>
</tr>
<tr>
<td>Maize</td>
<td>1.57</td>
<td>2.70</td>
<td>4.36</td>
</tr>
<tr>
<td>Upland Rice</td>
<td>1.03</td>
<td>1.20</td>
<td>2.32</td>
</tr>
<tr>
<td>Phaseolus Beans</td>
<td>0.48</td>
<td>0.71</td>
<td>1.83</td>
</tr>
<tr>
<td>Wheat</td>
<td>2.80</td>
<td>3.95</td>
<td>5.23</td>
</tr>
<tr>
<td>Cotton</td>
<td>1.60</td>
<td>2.63</td>
<td>3.64</td>
</tr>
<tr>
<td>Coffee</td>
<td>0.82</td>
<td>1.33</td>
<td>2.35</td>
</tr>
</tbody>
</table>

\(^1\)rain fed crops, except wheat; \(^2\)average research yields. Adapted from SPEHAR, 2006.
ADVANCES AND LIMITATIONS

- Soybean Adaptation to Low Latitudes
- Soil Amendment
- Cropping Definition
- Monocrop (Soybean, Maize)
- Acidity and Nutrient Scarcity, Deep in the Soil → Root Growth
- Deficiency
  - Information to Farmers
  - Infrastructure, Distance
  - Environmental Concern
Causes and Consequences of Reduced Information to Farmers

- Incomplete View of Production Factors
- Infrastructure Scrapping
- Reduced Use of Technology
- Environmental Damage

→ Inadequate Solution to Problems

→ Reduced Crop Performance and Income

→ Unsustainability
## Distance effect on income for major soybean producing States

<table>
<thead>
<tr>
<th>State</th>
<th>Distance(^1)</th>
<th>Received Price(^2)</th>
<th>Production Cost(^3)</th>
<th>Net Income(^4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Km)</td>
<td>(US $/ha)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rio G. do Sul</td>
<td>500</td>
<td>613</td>
<td>545</td>
<td>68</td>
</tr>
<tr>
<td>Paraná</td>
<td>500</td>
<td>613</td>
<td>545</td>
<td>68</td>
</tr>
<tr>
<td>São Paulo</td>
<td>500</td>
<td>613</td>
<td>545</td>
<td>68</td>
</tr>
<tr>
<td>Minas Gerais</td>
<td>700</td>
<td>587</td>
<td>545</td>
<td>43</td>
</tr>
<tr>
<td>Mato Grosso(^a)</td>
<td>1,200</td>
<td>555</td>
<td>570</td>
<td>-15</td>
</tr>
<tr>
<td>Mato Grosso(^b)</td>
<td>1,800</td>
<td>525</td>
<td>550</td>
<td>-25</td>
</tr>
<tr>
<td>Goiás</td>
<td>1,200</td>
<td>555</td>
<td>570</td>
<td>-15</td>
</tr>
<tr>
<td>Bahia</td>
<td>1,000</td>
<td>565</td>
<td>570</td>
<td>-5</td>
</tr>
<tr>
<td>Tocantins</td>
<td>1,200</td>
<td>555</td>
<td>570</td>
<td>-15</td>
</tr>
</tbody>
</table>

\(^1\)Average distance of production areas to port or industry; \(^2\)Average price in 2006; \(^3\)Regional average yield = 2.7 t/ha; \(^4\)Net income = received price - production cost; \(^a\)Southern area; \(^b\)Northern area
Main technologies and actions applicable or adjustable to farming types in Tropical Savannah
<table>
<thead>
<tr>
<th>TECHNOLOGY/ACTION</th>
<th>FAMILY</th>
<th>MEDIUM</th>
<th>LARGE SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Resource Survey and Utilization</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Climate Understanding and Monitoring</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Soil Amendment for Efficient Cropping</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Soil and Plant Management in Zero-Till</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Efficient <em>Rhizobium</em> Strains for Legume Crops</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Improved Legume, Fibber and Oil Crops</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>High Performance Cereals</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Novel grains and fibbers (<em>Quinoa, Amaranth, Kenaf</em>)</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>High Yielding Mango, Passion, Pineapple, Citrus</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Novel Fruits, Native and Exotic</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>
THE FUTURE
DIVERSIFICATION

OPPORTUNITY FOR PROFIT ON SUSTAINABLE BASIS
SUSTAINABLE CROPPING

- O.M.
- Porosity
- H₂O Retention
- Balanced Nutrition
- Biological Activity

SOIL

DIVERSITY

PLANT

> Efficiency
### Maize and quinoa production cost, income and net profit* ha\(^{-1}\)

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Maize</td>
<td>Quinoa</td>
</tr>
<tr>
<td>Mineral Oil</td>
<td>l</td>
<td>0.50</td>
<td>-</td>
</tr>
<tr>
<td>Desiccant</td>
<td>l</td>
<td>3.00</td>
<td>-</td>
</tr>
<tr>
<td>Seed</td>
<td>kg</td>
<td>20.0</td>
<td>15.0</td>
</tr>
<tr>
<td>Seed Treatment</td>
<td>kg</td>
<td>0.30</td>
<td>-</td>
</tr>
<tr>
<td>Fertilizer 8-20-20</td>
<td>kg</td>
<td>500.00</td>
<td>400.00</td>
</tr>
<tr>
<td>Insecticide</td>
<td>kg</td>
<td>0.03</td>
<td>-</td>
</tr>
<tr>
<td>Herbicide 1</td>
<td>l</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Herbicide 2</td>
<td>l</td>
<td>3.00</td>
<td>-</td>
</tr>
<tr>
<td>N Band Application 1</td>
<td>kg</td>
<td>160.00</td>
<td>80.00</td>
</tr>
<tr>
<td>N Band Application 2</td>
<td>kg</td>
<td>160.00</td>
<td>60.00</td>
</tr>
<tr>
<td>Weed Management</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Indirect Cost</td>
<td>R$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total Cost</td>
<td>R$</td>
<td>1,101.98</td>
<td>824.88</td>
</tr>
<tr>
<td>Yield</td>
<td>t/Ha</td>
<td>7.20</td>
<td>2.00</td>
</tr>
<tr>
<td>Income</td>
<td>R$</td>
<td>1,440.00</td>
<td>2,000.00</td>
</tr>
<tr>
<td>Net Profit</td>
<td>R$</td>
<td>338.02</td>
<td>1,175.12</td>
</tr>
</tbody>
</table>

*US $1.00=R $2.10; values and exchange rates for 2006.
PROJECTED FIGURES
### Cerrado utilization, cultivated area (Ha), production and value (US $): Present and Future

<table>
<thead>
<tr>
<th>Utilization</th>
<th>Present</th>
<th>Future (year 2050)$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area ($10^6$)</td>
<td>Production ($10^6$)</td>
</tr>
<tr>
<td>Cultivated Pasture</td>
<td>60.0</td>
<td>78 AU$^1$</td>
</tr>
<tr>
<td>Grain Crops</td>
<td>15.0</td>
<td>50 t</td>
</tr>
<tr>
<td>Fruit, Fibber, Others$^3$</td>
<td>33.5</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>108.5</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: SPEHAR (2006). $^1$AU=Animal Unit, irrespective of development phase and weight; $^2$When transformation with added value is included, the total amounts to US $350 billion. $^3$Native pasture, e*trativism, forestry.
PERSPECTIVE FOR DIVERSIFICATION

CONTRIBUTION

- Perfection of Grain, Fibber and Fruit production
- High quality, enriched and diet food
- Agroindustry advance
- Environmentally balanced exploitation
- New products and agriculture security
- Opportunities to agribusiness

NEEDS

- Investment in new species - Research lever
- Variability enrichment
- Development of new products
- Technology validation
- Partnership
- New policies to support diversification
Chronology of events related to Cerrado development, with respective origin, results and consequences.

<table>
<thead>
<tr>
<th>Event</th>
<th>Period</th>
<th>Origin</th>
<th>Result</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving the Capital</td>
<td>1956-1960</td>
<td>Public</td>
<td>Instant</td>
<td>Hinterland Settlement</td>
</tr>
<tr>
<td>Rural Development</td>
<td></td>
<td></td>
<td></td>
<td>Savannah Farming</td>
</tr>
<tr>
<td>Incentive</td>
<td>1975-1985</td>
<td>Public</td>
<td>Mid-Term</td>
<td>Land Purchase/Lease</td>
</tr>
<tr>
<td>Research</td>
<td>1975-2008</td>
<td>Public - Private</td>
<td>Mid-Term</td>
<td>Technology Acquisition</td>
</tr>
<tr>
<td>Extension</td>
<td>1975-2008</td>
<td>Public - Private</td>
<td>Mid-Term</td>
<td>Technology Transfer</td>
</tr>
<tr>
<td>Training/Education</td>
<td>1975-2008</td>
<td>Public - Private</td>
<td>Long-Term</td>
<td>Technology Application</td>
</tr>
<tr>
<td>Main Infrastructure</td>
<td>1975-1995</td>
<td>Public - Private</td>
<td>Long-Term</td>
<td>Production Flow</td>
</tr>
<tr>
<td>Input Industry</td>
<td>1975-2008</td>
<td>Public - Private</td>
<td>Mid-Term</td>
<td>Input/Output Supply</td>
</tr>
<tr>
<td>Modern Production</td>
<td></td>
<td></td>
<td></td>
<td>Agricultural Advance</td>
</tr>
<tr>
<td>High Technology</td>
<td>1990-2008</td>
<td>Public - Private</td>
<td>Mid-Term</td>
<td>Increasing Yields</td>
</tr>
<tr>
<td>Reduced Incentive</td>
<td>1990-2008</td>
<td>Public</td>
<td>Mid-Term</td>
<td>Change Farming Standard</td>
</tr>
<tr>
<td>Information Delivery</td>
<td>1995-2008</td>
<td>Public - Private</td>
<td>Mid-Term</td>
<td>Technology Access</td>
</tr>
<tr>
<td>Output Transformation</td>
<td>1990-2008</td>
<td>Private Sector</td>
<td>Long-Term</td>
<td>Added Value</td>
</tr>
<tr>
<td>Farming Support</td>
<td>1995-2008</td>
<td>Public</td>
<td>Long-Term</td>
<td>Balanced Production</td>
</tr>
</tbody>
</table>
Cerrado References for Savannah Agricultural Development

• Utilization of reliable statistics to guide development initiatives, pursuing the tools for success and the remedy for failure

• Survey on biophysical and socio-economic conditions, aiming at hierarchy of development components

• Quantification of environmental conditioners of agriculture and rural development

• Knowledge about the structure of land tenure

• Establishment of participatory public policies for development

• Demand identification and involvement of stakeholders - Technological packages

• Definition of institution, personnel, financial support, infrastructure and sources for prioritized research and development projects

• Definition of interest group, responsibilities and leadership geared at cooperative efforts and modus operandi of partnership

• Monitoring and correction measures during the process
Obrigado
Gracias
Thank You