Climatic Risks Zoning and Brazilian biofuels agriculture

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Embrapa

USDA Global Conference on Agricultural Biofuels: Research and Economics
Minneapolis, Minnesota     August 20-22, 2007
Brazilian Agricultural Zoning

- Agribusiness GDP in 2006: US$ 180 billions (33% GDP - US$ 500 billion)
- Agribusiness Exportations: US$ 35 billions (42%)
  Grain production in 2007: 133.4 millions tons
- Program coordinated by the Department of Agriculture and EMBRAPA (National Institute for Agricultural Research) since 1995
- Federal Farm Credit Policy
  US$ 8 billion (US$ 2.5 billion for small farmers)
Loss of production: 91/92 e 92/93 (Source: IPEA/UNB)

<table>
<thead>
<tr>
<th>Product</th>
<th>S. PAULO</th>
<th>BAHIA</th>
<th>Northeast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice</td>
<td>30%</td>
<td>34%</td>
<td>47%</td>
</tr>
<tr>
<td>Bean</td>
<td>21%</td>
<td>34%</td>
<td>41%</td>
</tr>
<tr>
<td>Corn</td>
<td>16%</td>
<td>37%</td>
<td>71%</td>
</tr>
<tr>
<td>Soybean</td>
<td>16%</td>
<td>29%</td>
<td>-</td>
</tr>
<tr>
<td>Soybean-Irrigated</td>
<td>-</td>
<td>-</td>
<td>32%</td>
</tr>
<tr>
<td>Cotton</td>
<td>22%</td>
<td>22%</td>
<td>81%</td>
</tr>
<tr>
<td>Castor Oil</td>
<td>-</td>
<td>-</td>
<td>87%</td>
</tr>
</tbody>
</table>

Cause: Water deficiency in critical phases: 60%
Water excess - harvesting: 30%
Main Objective

✓ Decrease the climate risks
  ➢ dry spells during flowering and grain-filling (60%)
  ➢ excessive rain during the harvest period (30%)

Product

✓ Planting Calendars
✓ Crops: Corn, Soybean, Beans, Rice (Wheat, Sorghum, Fruits, Coffee and biofuel crops)
✓ Periods: Dekad (10 days), Oct to Dec (Jan to Dec)
✓ Counties / Municipal districts
✓ Macro-regions: Central, Southeast, South and Northeast
✓ Risk: less than or equal to 20%
General Methodology

- Simulation of cumulative water balance for different soil types, planting dates, cycle lengths, ground stations

- Decision criteria / Risk Analysis:
  a) WRSI during reproductive stage \( \geq \) Threshold Value (80% of all simulated years)
  WRSI: Water Requirement Satisfaction Index
  \[
  WRSI = \frac{\text{actual}}{\text{maximum evapotranspiration}}
  \]
  b) Excessive rain during harvest
Data Base

✓ Length of four growth stages (Initial, Vegetative, Reproductive and Maturity) for early and normal cultivars
✓ Length of total growing period
✓ Crop coefficient (Kc)
✓ Soil water holding capacity
✓ Rainfall
✓ Evapotranspiration
CLIMATIC risks zoning
Rain stations distribution
f(wrsi(x))

3ª phenological phase

WRSI = value

WRSI

criterion

P

days

0 1 2 3 4 5 33 34 35
Actually Zoning Crops

- Rice
- Beans
- Corn
- Wheat
- Soybeans
- Sorghun
- Coffee
- Cotton
- Castor Bean
- Apple
- Vigna beans
- Banana
- Cashew nuts
- Barley
- Maninhhot
- Oil Palm (2007)
- Sunflower (2007)
- Peanuts (2007)
- Rape seed (2007)
Oil Palm: possible surface production with low risk—Bahia State
Oil Palm Potential

[Oil] 22%

Oil yield 3000 Kg/ha/year

5 ha = one family (5 persons)
Important policy to the small farms
Sunflower possible surface production with low risk

South region
Sunflower possible surface production with low risk

Others regions
Sunflower Production (2005)
[Oil] - 44%

Oil Yield 430 kg/ha/year

ARGENTINA

ÁREA (1000 ha)  PRODUÇÃO (1000 t)

2300  4000

44  63

BRASIL

5400

3000

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Peanuts possible surface production with low risk

Oil Yield – 600 kg/ha/year
Peanuts

Yield 600kg/ha/year

[oil] 50%

Área (1000 ha)  Produção (1000 t)

Brasil (anos 80)  700  970
Brasil (2004/5)   129  302

Nordeste(*) Potencial

1000 1000

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Castor Bean possible surface production with low risk

Oil Yield ~ 1000 Kg/ha/year
Castor Bean

[oil] 48%
Important option for the small farmers
Evolution of castor bean crop in Brazil

Área colhida (1)(1.000 ha)
Produção (1) (1.000 t)

Castor bean
Soybean possible surface production with low risk

Oil Yield  500 Kg/ha/year
Sugar Cane Preliminary zoning to new areas expansion

12 regions to expansion of Ethanol production

Slide from prof. Luiz Cortez UNICAMP/SP
Sugar Cane with low risk Mato Grosso State
Biomass Potential production

Cana de Açúcar

93 T/ha

86 T/ha
Ethanol potential production

Mato Grosso

Álcool

7461 L/ha

6948 L/ha
Climatic risks zoning in Piauí State

Low Risk
Intermediate
High Risk
Ethanol potential production
Products Organization
Zoneamento Agrícola Safra 2007-2008

Estado: MG
Municípios com Planto Favorável em: 11/11 a 20/11

Agritempo
Portaria: 142, Data: 16/7/07

Cultura: MAMONA COM ZONEAMENTO
Solo Tipo: (3) Argíloso
Ciclo: Médio
Thanks

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