Social impact of biofuel production: The case of Brazilian ethanol

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Social impact of biofuel production

- Biofuel production has a strong impact in the economies of many countries.
- Very often the social impact of the endeavor is overseen in favor of economical
- Here I will review some social consequences of bioethanol production in Brazil.
Bioethanol in Brazil

- Bioethanol in Brazil: Sugar cane
  - Favorable 9:1 energy balance, compared to 2:1 for corn ethanol.
- Large distribution infrastructure: Petrobrás.
Brazilian economy from XVI to XVIII centuries based on sugar exports to Europe.

Labor intensive processes powered by slave manpower.

Very hard conditions in the fields.

End of slavery in 1888 led to the end of the Empire in 1889.

At this time coffee had surpassed sugar as main Brazilian export.
Historical background
1973: Proálcool

- **Context:** Oil crisis
- **Objective:** to reduce petroleum imports.
- **Investment:** subsidy program (US$10 bn).
- **Results:** avoided oil imports (US$60 bn).
- **Main actions:**
  - Ethanol price fixed on 65% of gasoline (advantage to ethanol)
  - Anhydrous ethanol added to gasoline, hydrated ethanol as combustible
  - Production quotas: cane, sugar and ethanol
  - Governmental control of sales: distribution by Petrobras
  - Tax reduction for ethanol-powered cars
- **Mid 80s:** 90% of all cars sold in Brazil were ethanol powered.
- **90s: Ethanol crisis**
  - Increase of sugar price in the international market
  - Technical problems with ethanol-powered cars.
Historical background
Flex fuel and revival

Incentives, mandatory blends, new technologies
Deregulation, Sugar Exports
Flex Fuel
Global Market?

Ethanol production (billion liters)

1973
Oil crisis & low sugar prices.

1975
PROÁLCOOL FIRST PHASE
Mandatory blend and subsidies.

1978-1979 PROÁLCOOL – SECOND PHASE
Fiscal incentives and tax exemptions for ethanol production and E-100 fueled cars. All gas stations must obligatorily sell ethanol. Low ethanol prices (65% of gasoline’s) guaranteed at the pump.

2003 FLEX FUEL
Flex fuel vehicles begin to be sold.

ETHANOL CRISIS at the end of the 80s
Oil prices down. Brazilian government cuts support. Higher sugar prices affect ethanol production and sales of E-100 cars went down rapidly.

Source: Datagro, 2006. Elaboration: Icone and UNIC.
Where Brazil plants sugarcane?

- **North-east coast:**
  - Oldest (XVI century)
  - 55 ton/ha

- **South-east**
  - Highest productivity
  - >82 ton/ha
  - Highest mechanization

- **Center-west**
  - Highest potential for expansion

South-Central region represents 87% of sugarcane harvest.
What is at stake?
Food security vs. Fuel security

Small bioenergy footprint

- Total country area (851 Mha, 100%)
- Rural properties area (355 Mha, 42%)
- Area used for agriculture (76.7 Mha, 9%)
- Area used for sugarcane for ethanol (3.4 Mha, 0.4%)

Source: Horta Nogueira and Seabra (2008)
Working conditions in the sugarcane fields: manual harvesting

- Manual harvesting traditionally involves burning of the straw to facilitate cutting
Burning

Prazo para a eliminação da queima da palha da cana no estado de São Paulo

áreas mecanizáveis
áreas não-mecanizáveis

Percentual de cana colhida sem queima

Protocolo Agroambiental
Lei Estadual nº 11.241/02

Nota: os pontos destacados nas linhas do gráfico mostramos anos específicos citados na Lei ou no Protocolo.
Elaborado pela Unica.
Working conditions

- One sugar cane worker cuts 10-12 tons per day
- Wages are seasonal
  - Although they are low, they are the second best in agriculture in Brazil
- São Paulo State: best working conditions and best statistics available
- Recent study announced by the Secretary of Health
  - 27 mills in São Paulo State
  - A worker
    - does 17 back movements and 54 hits in the cane per minute
    - loses 8 liters of water per day
    - walks 9 km per day
    - has bad sanitation conditions
Canasat: Monitoring sugarcane crop and harvesting in the SP state

- Possible to monitor the sugarcane burning
- Clear progress towards reducing burning
- Social problem:
  - Mechanization creates unemployment of marginally qualified personnel
  - 115 k jobs lost because of mechanization
  - Need to qualify
Job penetration

Sugarcane and ethanol

Petroleum extraction and oil by-products

Bioethanol Consumption

Bioethanol consumption (liters)

Source: UNICA
Bioethanol production in Brazil has social costs and benefits.

Although the working conditions are very harsh, there is a clear social inclusion effect by hiring workers with very low qualification.

Sugarcane industry: 630 k jobs in the fields and 570 k jobs in production: more than 1 million people.

Regulations are in the good direction but still more than half of all sugarcane planted in Brazil is harvested manually.

Bioethanol production is not a threat to food security.