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The Brazilian Ethanol Program

Biofuels for Transport

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CENTER FOR INTEGRATED STUDIES ON CLIMATE CHANGE AND THE ENVIRONMENT

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The Brazilian Ethanol Program Biofuels for Transport

- Since it was first launched in 1975, the Brazilian Ethanol Program remains to date the largest commercial application of biomass for energy production and use in the world.

The Brazilian Ethanol Program Biofuels for Transport

- It succeeded in demonstrating the technical feasibility of large-scale ethanol production from sugarcane and its use to fuel car engines.

Institutional Arrangements, Technological Capacity and Public Regulation

- Since 16th century ⇨ Brazil has always been an important sugar producer and exporter

- Bending trend of international sugar prices + increasing burden of the petroleum bill after 1973 → Brazilian Government decides to launch the Ethanol Program

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Institutional Arrangements, Technological Capacity and Public Regulation

- After second oil crisis ⇨ tax reductions turned ethanol fuel at the pump and ethanol powered car prices highly attractive to consumers.

- Since 1979 → 5.4 million ethanol powered cars.

- 1998 → these cars consumed 7.6 billion liters of ethanol and 5.3 billion liters of ethanol were used for the production of gasohol (22% ethanol + 78% gasoline) for the remaining cars in Brazil.

Institutional Arrangements, Technological Capacity and Public Regulation

- Mid-eighties ⇨ Sharp decrease of oil prices in the international market seriously affected the cost-effectiveness of the Ethanol Program
- Production capacity stops growing: Government cut soft loans for building of new distilleries
- Consumption growth slows down:
- 2.9 billion liters in 1981,
- 11.6 in 1986, 12.3 in 1992
- 1989-1990: supply shortage crisis

Institutional Arrangements, Technological Capacity and Public Regulation

- 1988 ⇨ ≈ 100% new cars = ethanol powered cars
- 1997 and 1998 ⇨ nearly zero
- 1999 ⇨ cost-effectiveness of the Ethanol
- Program has significantly improved:

  → oil prices x 2 (international market)

  → 1 US$ = 1.2 R$ to 1 US$ = 1.9 R$

Institutional Arrangements, Technological Capacity and Public Regulation

- Brazilian car production in 2002: 1.5 million ≡ ethanol share ≈ 3.16% (48 thousand)
- 2002 ≈ 5.5 billion liters used in a 22 to 25% blend with gasoline
- 2003 ≈ 3 million vehicles powered by hydrated alcohol → 4.9 billion liters/year
- 2003-2004 : Launching of “Flexfuel” cars in the market

Economical Impacts

- Over the last 22 years, hard currency savings amounted to 1.8 billion US dollar/year with the replacement of ≈ 200,000 barrels of gasoline/day

- PETROBRAS plays a fundamental role in the transport and distribution of alcohol affording the financial burden of ethanol storage

Economical Impacts

- 1999 ⇨ production cost of alcohol still higher than price of gasoline manufactured from imported oil at just bellow US$ 20/barrel (≈ ½ of its international price in 1980) → main reason for the financial difficulties faced by the program.

Economical Impacts

- Impressive technological progress has been continuously reducing ethanol production costs, but oil prices still required to be around US$ 30 per bbl for ethanol to be cost-effective.

- The Ethanol Program has also been a mechanism of transfer of subsidized public funds (a total of ≈ US$ 10 billions) to a few important industrialists.

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Social Impacts

- Creation of 720,000 direct jobs and 200,000 indirect jobs in rural areas (↓ social and environmental disruption in big cities)

➔ This positive social effect can be reduced by the penetration of mechanical harvesting

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Environmental Impacts

Source: Macedo, 1992

Brazil: Net CO_2 Emissions Due to Sugarcane Production and Use, 1990-91	**Mtons C/Year**
Ethanol Substitution for Gasoline* *Including blending 22% of ethanol with gasoline and 4.2 million pure ethanol-fired cars	- 7.41
Bagasse Substitution for Fuel Oil Burning as Heat Source in Other Industries	- 3.24
Fossil Fuel Utilization in Sugarcane Industry	+ 1.20
Net Contribution (uptake)	- 9.45

Environmental Impacts

- Local air pollution during harvesting season (burning required for manual harvest, use of sugar cane bagasse in the boilers)

- The replacement of gasoline by ethanol reduced atmospheric pollution in large Brazilian cities avoiding to release in the atmosphere significant amounts of CO and HC

(1980-1990)

Conclusions

- With "high" oil prices ≈ US$ 40/barrel → economic incentive for Ethanol program expansion

- With "low" international oil prices (below ≈ US$ 30/barrel) → Ethanol Program growth will depend upon its contribution to curb the increase of the ***greenhouse effect***

Conclusions

- A new phase of the Ethanol Program can be launched with adequate flow of foreign investment,
  - → either through CDM projects
  - → or international partnerships
- Future Prospects ⇨ Flex-Fuel cars and exports → can increase the ethanol production in Brazil
- Growing interest in other countries ⇨ international partnerships

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