



Brazilian Bioethanol Science
and Technology Laboratory



PAN-AMERICAN
BIOFUELS &
BIOENERGY
SUSTAINABILITY
AN NSF RESEARCH COORDINATION NETWORK



 OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

Food Security and Biofuels: Can Policy Flexibility Reduce Food Price Crisis for the Poor?

Part 1: Global Markets and Brazil Sugarcane Production Case

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RCN Pan American Biofuel and Bioenergy Sustainability Conference

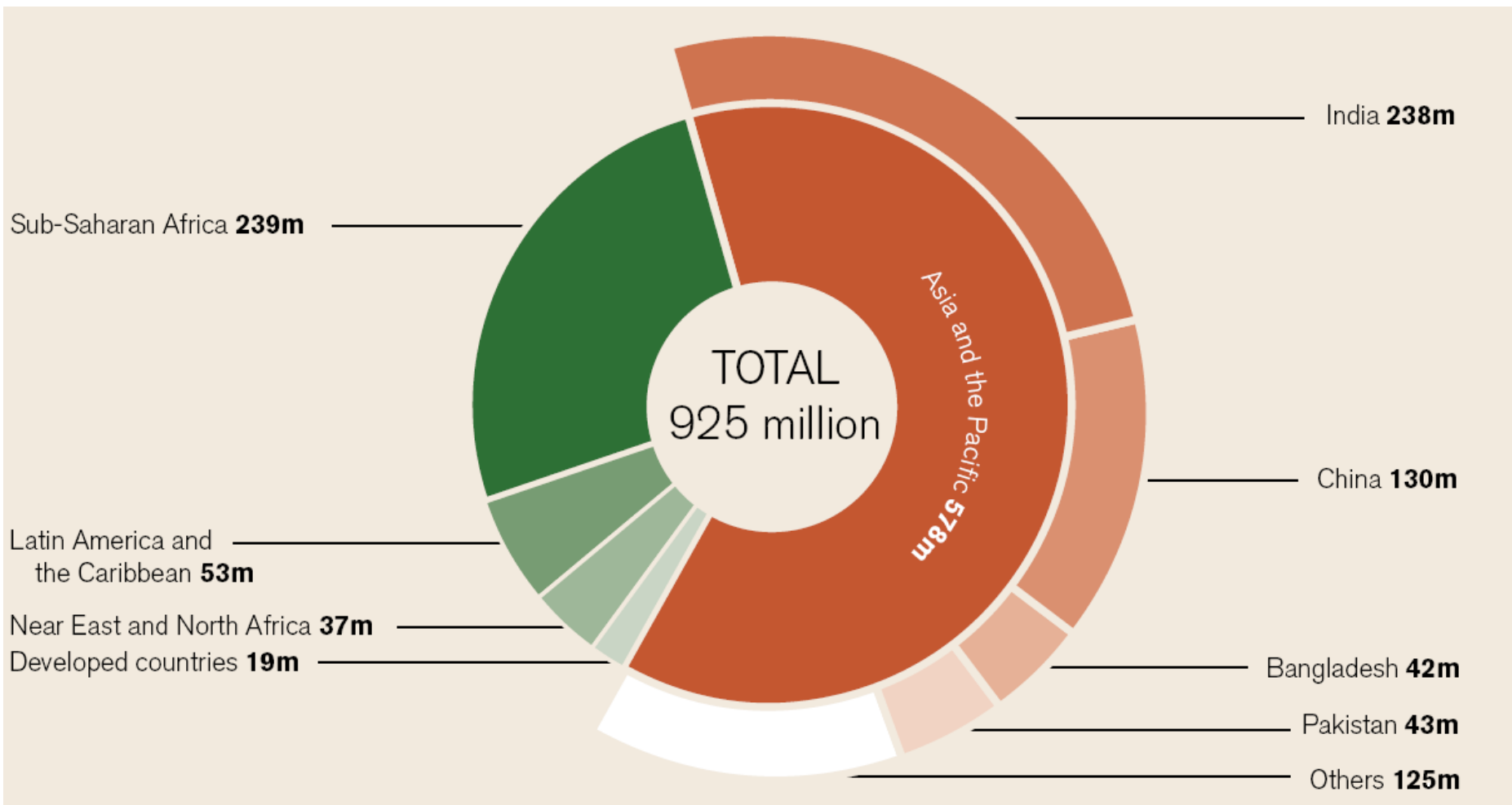
Recife, PE – July 23-25, 2014



Contents

- Food vs Fuel context
- Points of view
- Bioenergy demand
- Sugar and ethanol markets
- Public policies
- Final comments

World Hunger





Food Security Definition

Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (1996 World Food Summit)

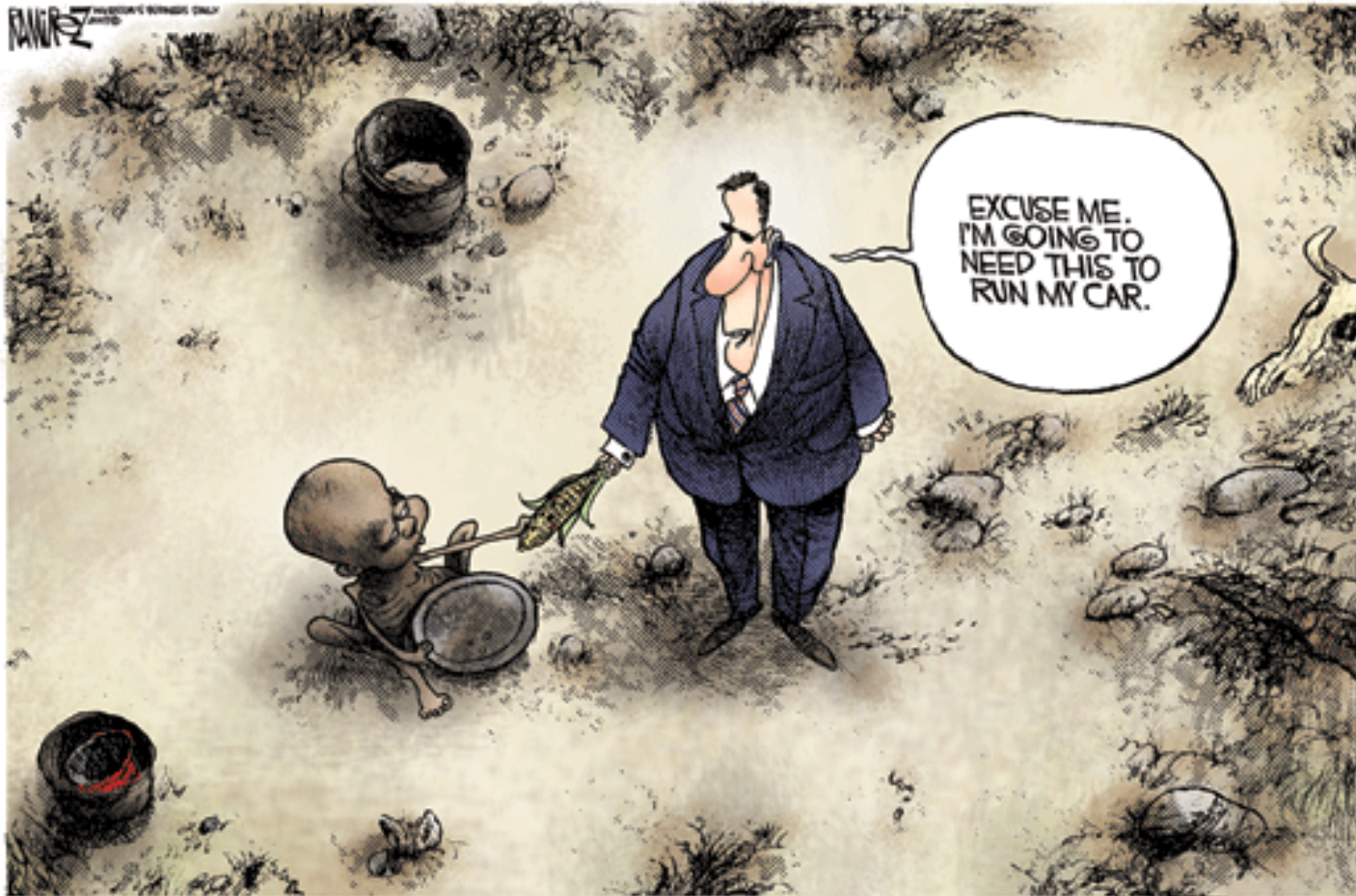
Four main dimensions

- Availability
- Access
- Utilization
- Stability

Food vs Fuel

- Current media coverage has been negative.
- Media and popular discourse reinforce ideas that:
 - Food is being used for biofuels
 - Biofuels contribute to global hunger and food insecurity
- Negative opinions undermine public and political support, and have direct effects on policies and investment
 - Example: EU RED revised to cap biofuels produced from conventional (food) feedstocks
 - Popular pressure to reduce or eliminate the USA RFS ethanol requirements

The Food vs Fuel Discussion





Common Proposed “Solutions”



1. **Simply forget biofuels**

- Focus on solar, wind and conservation

2. **Only use “non-food” crops for biofuels**

- Several NGOs and governments testing this idea

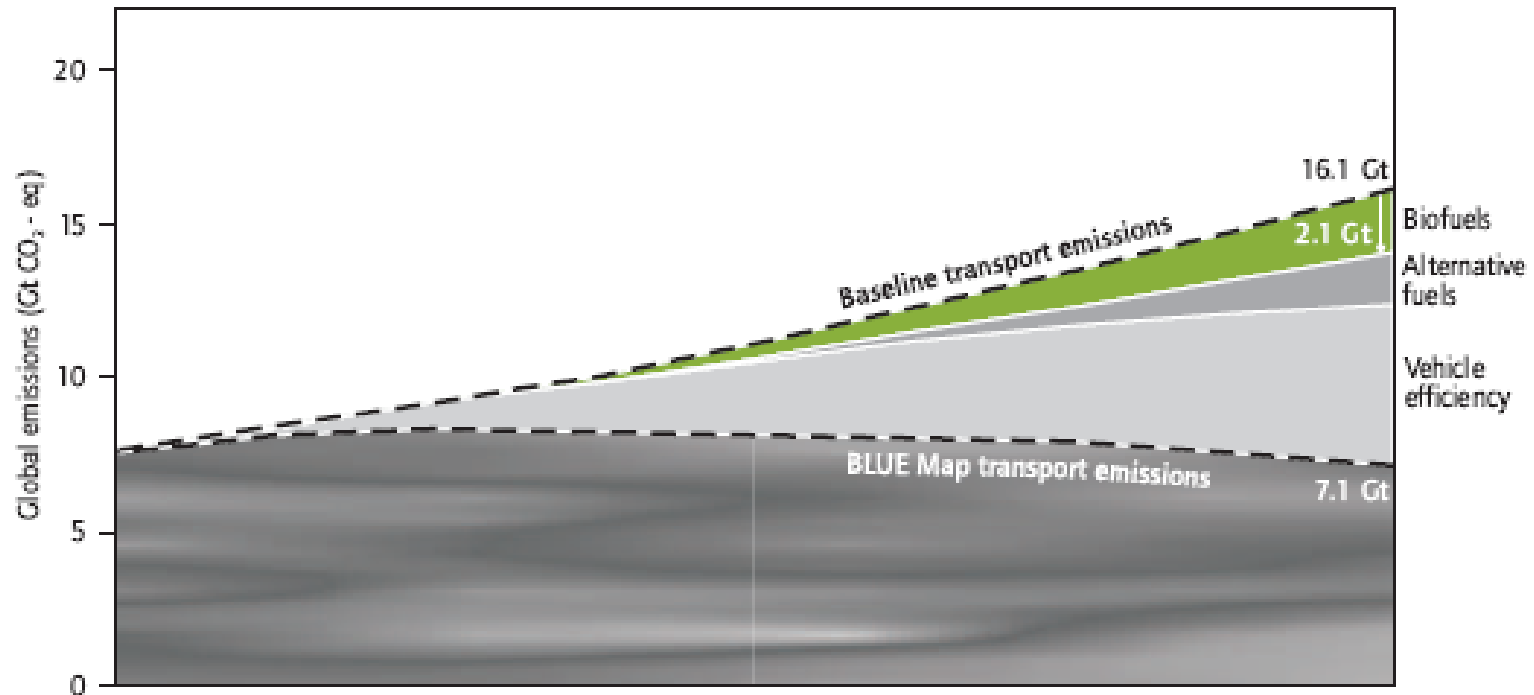
3. **Change policies so they adjust biofuel production in response to food crises**

- Recommendation from the November 2013, 40th Meeting of the United Nations Committee on Global Food Security

1. Simply forget biofuels

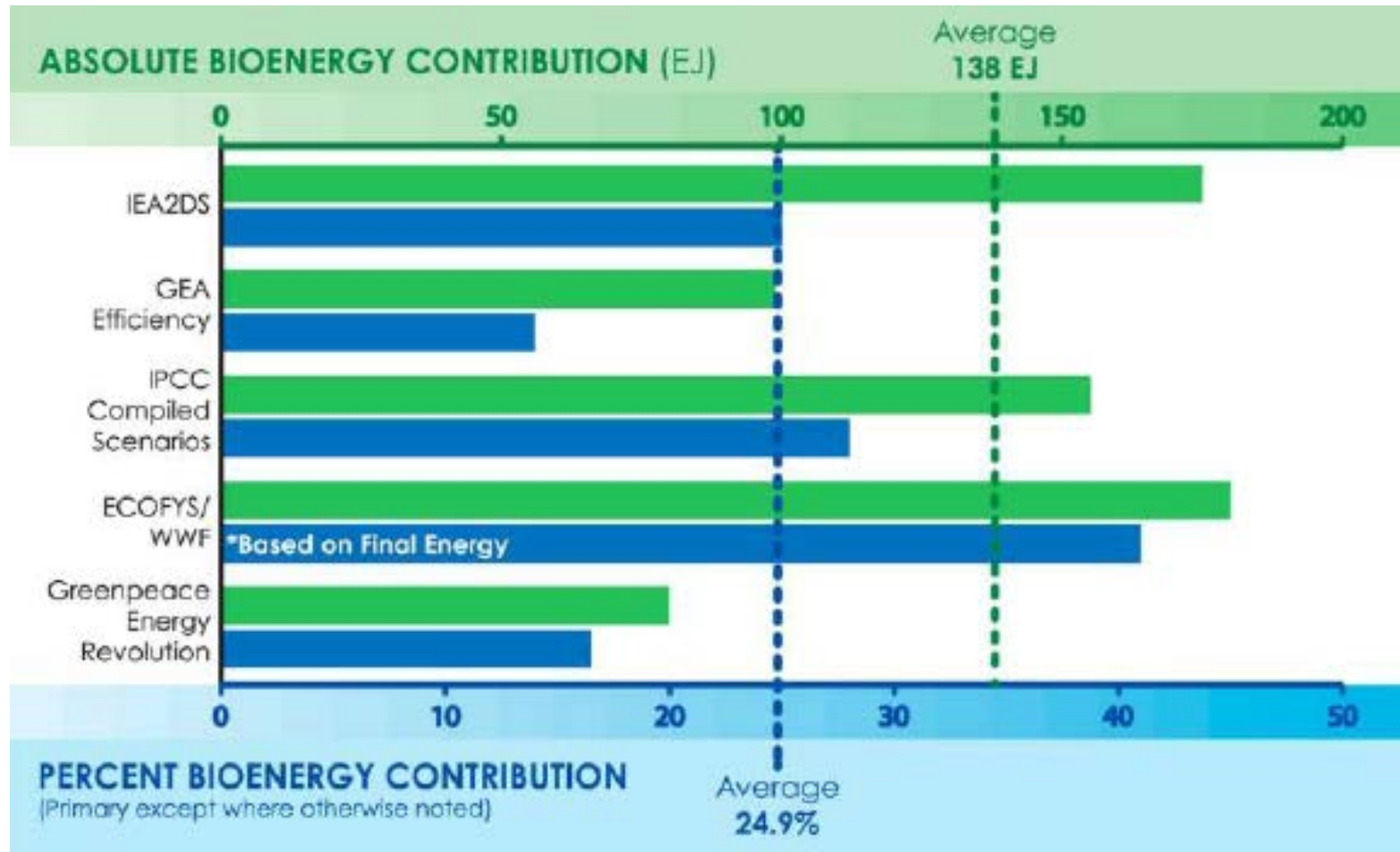
- Focus on solar, wind and conservation
- Solar and wind can play important roles
- But they cannot, in near to medium term, alleviate needs for liquid transport fuels
- Conservation should always be first priority
- However, all research suggests need for dense liquid fuels for transport...

After efficiency, biofuels are most important option available to cut emissions from transport sector



Note: Modal shifts (not included) could contribute an additional 1.8 Gt CO₂-eq. of emission reductions.

Source: IEA, 2010c.



Source: B. Dale et al., 2014

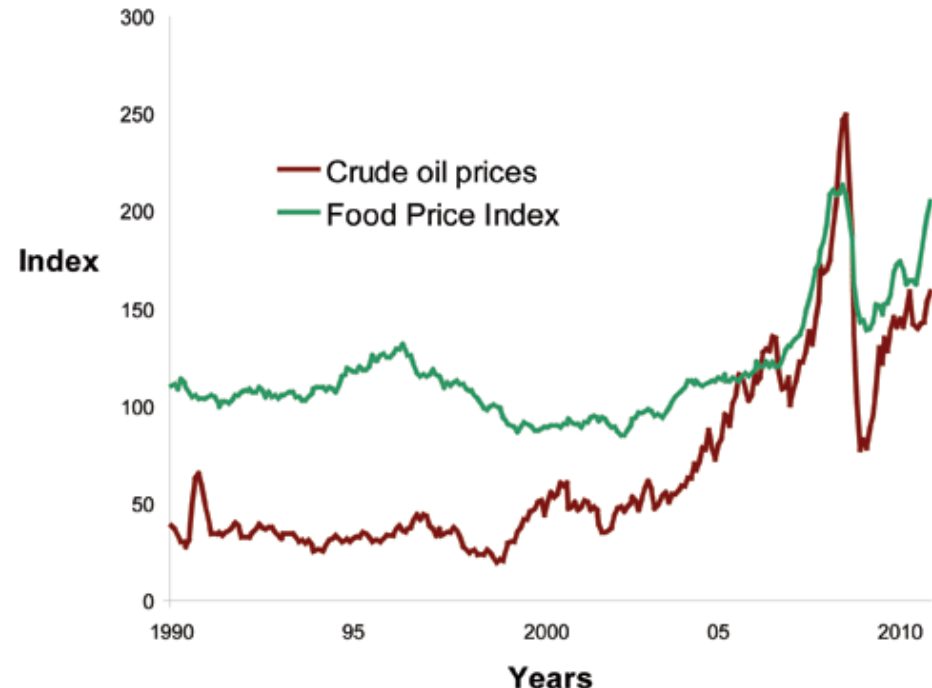
So, several important institutions consider that biofuels will be needed

2. Only use “non-food” crops for biofuels

- Several NGOs and governments testing this idea
- Evidence to date...
 - Non-food crops lack improved seeds and markets
 - First RSB-certified “Sustainable” biofuel project in Latin America (Yucatan Jatropha) was bankrupt before it produced first liter of fuel
 - Costs and risks are high (algae and other “next-gen” feedstocks)
 - **Fact:** You cannot eat “non-food crops”
 - Therefore, using land, labor and water to produce inedible crops could have opposite effect of that desired

3. Change policies so they adjust biofuel production in response to food crises

- Recommendation from the November 2013, 40th Meeting of the United Nations Committee on Global Food Security
- Food “crises” typically occur suddenly, exemplified by spikes in local staples in affected countries
- Food “crisis” have other causes than competition for feedstocks



3. Change policies so they adjust biofuel production in response to food crises

- Major *assumptions that* -
 - Current conventional feedstock production systems can respond quickly
 - Suspension of biofuel policy/mandate will “free-up” food feedstocks
 - The biofuel response in US or Brazil will help avert or mitigate food crises in distant, affected nations

Our project explores these assumptions...

Our Project

We review recent research and data relevant to the world's two largest biofuel production systems:

- Brazil sugarcane ethanol (this talk)
- US maize (corn) ethanol (next talk)

These two systems represent nearly 90% of the global ethanol production. We will attempt to answer the following questions:

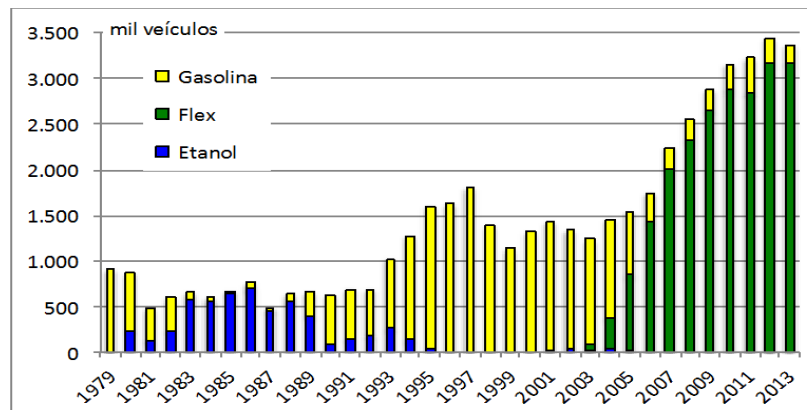
- How does the feedstock use for biofuel interact with food security and global food prices?
- How do government policies affect the natural equilibrium of food prices and prices volatility?

Finally, we will provide recommendations for moving forward constructively.

Flexibilities in Brazilian Sugar/Ethanol Sector (1)

- **Production side:** most mills have the flexibility to direct the amount of sugar in cane for sugar or ethanol (around 40-60% range); it is possible for most distilleries to adjust the ratio hydrous/anhydrous.
- **Demand side:** >60% of Brazil light duty vehicles are Flex-Fuel (FFV's) that can be operated using:
 - 100% hydrous ethanol
 - Gasoline-C (or gasohol) with 18-25% ethanol blend
 - or any mixture of these two fuels, e.g., from 18% blend to 100% ethanol.

New LDV sale





Brazilian Sugarcane Sector Profile

Mill type	Number of mills	Milled cane (Mtc/y)	% milled cane
Sugar/ethanol	257	378.4	67.4
Ethanol distillery	127	161.2	28.7
Sugar mill	18	21.4	3.8
Total	402	561.0	100.0

Source: CONAB, 2012

Notes:

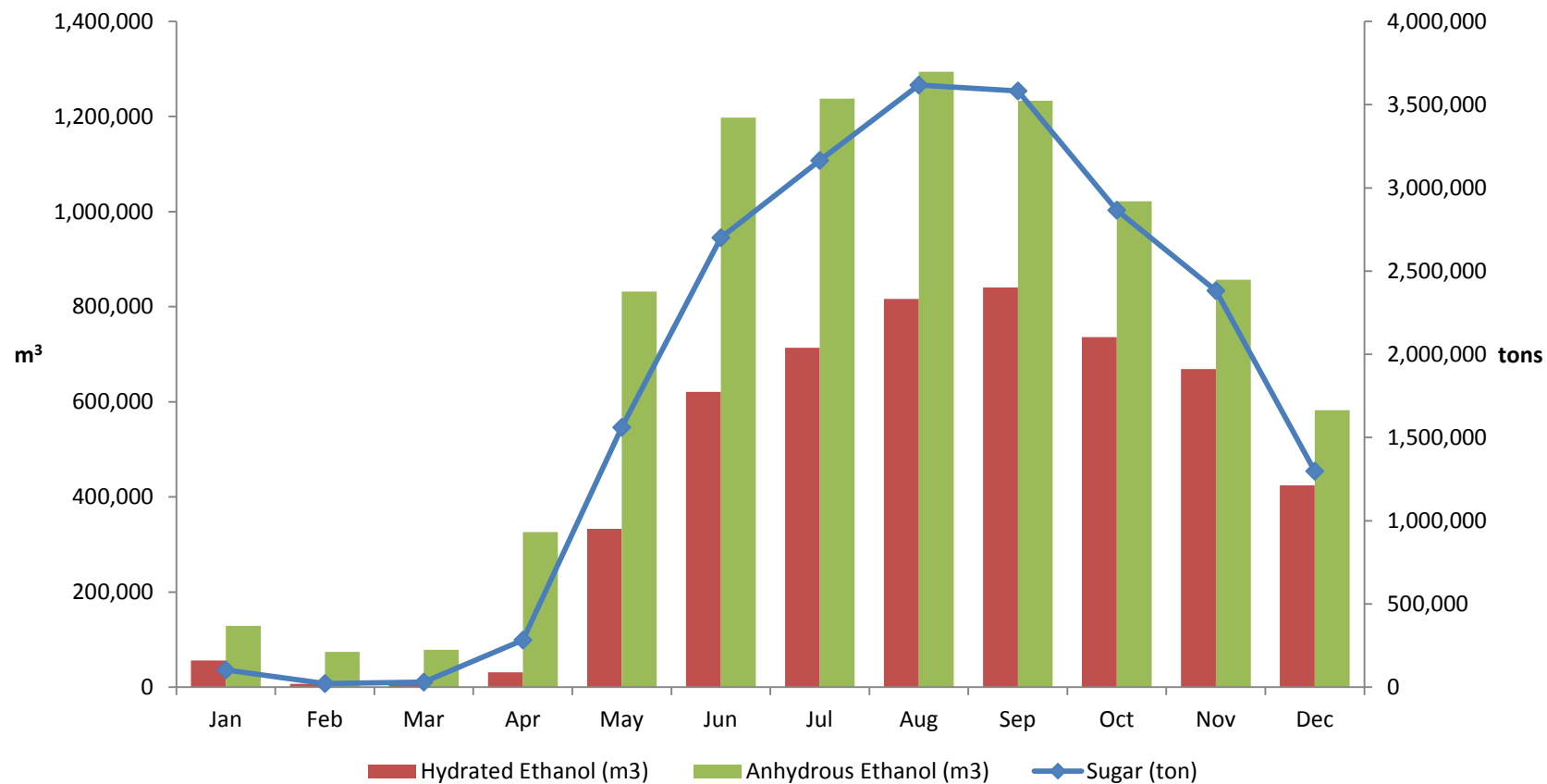
1. More than two thirds of the cane is milled in sugar/ethanol units; this number tends to grow
2. These mixed mills have, on average, a flexibility to produce 40% to 60% of either product
3. The international model of sugar only has almost disappeared in Brazil

Flexibilities in Brazilian Sugar/Ethanol Sector

- **Feedstock production flexibility:** Although mills have some flexibility, annual cane production is relatively fixed, being a product of the areas previously planted and weather.
 - After fields are prepared for cane, it takes normally two seasons before first harvest begins
 - Harvests then continue for 5 or more years
 - So increases in planted area require foresight and large investments
- **Ability to adjust processing in response to markets:**
 - Decisions to produce sugar or ethanol are based on market analysis, risk and long-term contracts
 - The contracts are usually set before cane processing season, (or safra) May-Dec, begins.
 - This limits ability for mills to make changes in sugar-ethanol mix on short notice.

2007-2014 Sugar and Ethanol Production

Average monthly production of mills - Sao Paulo State (2007-2014)

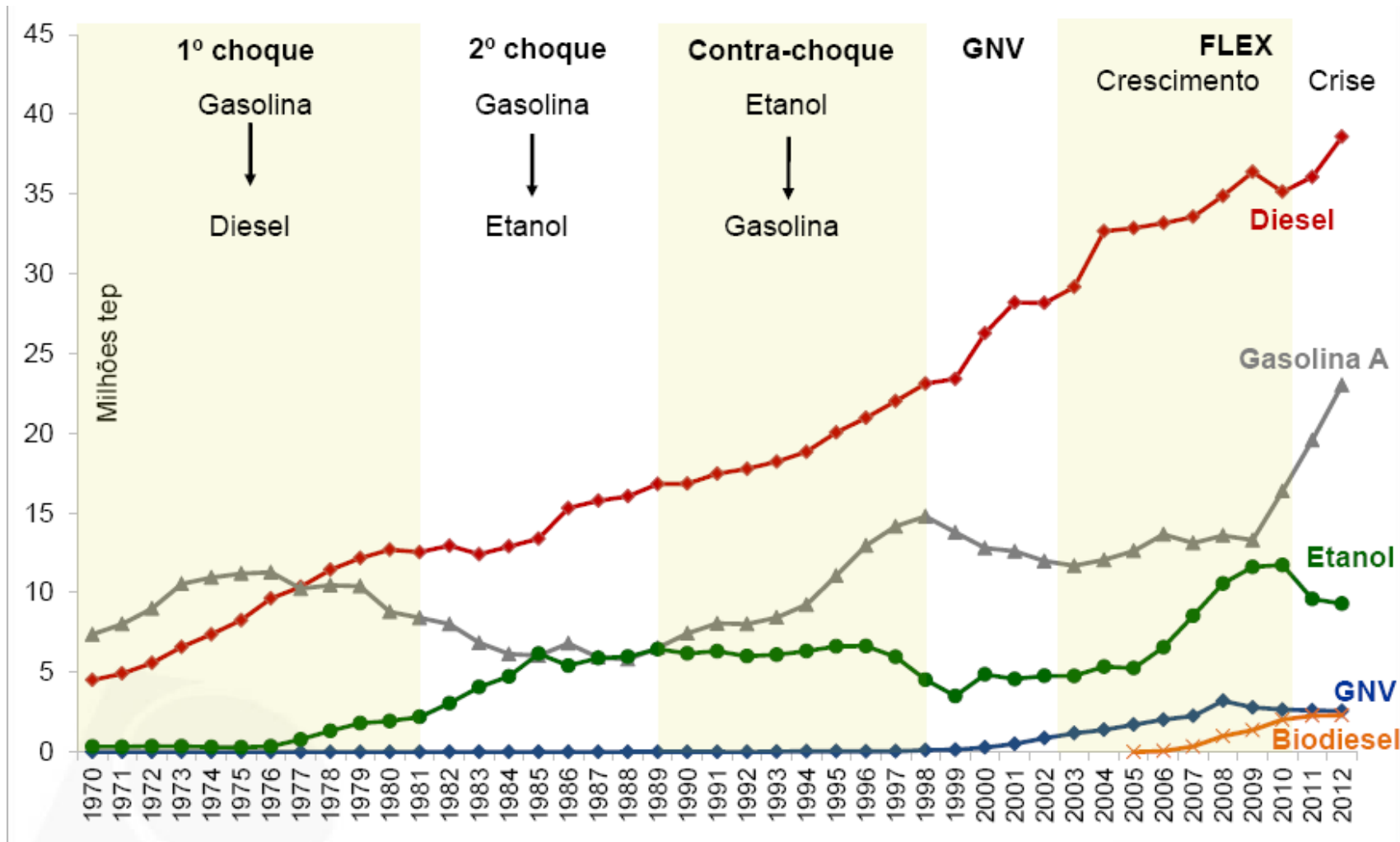


Source: Capitani et al., 2014

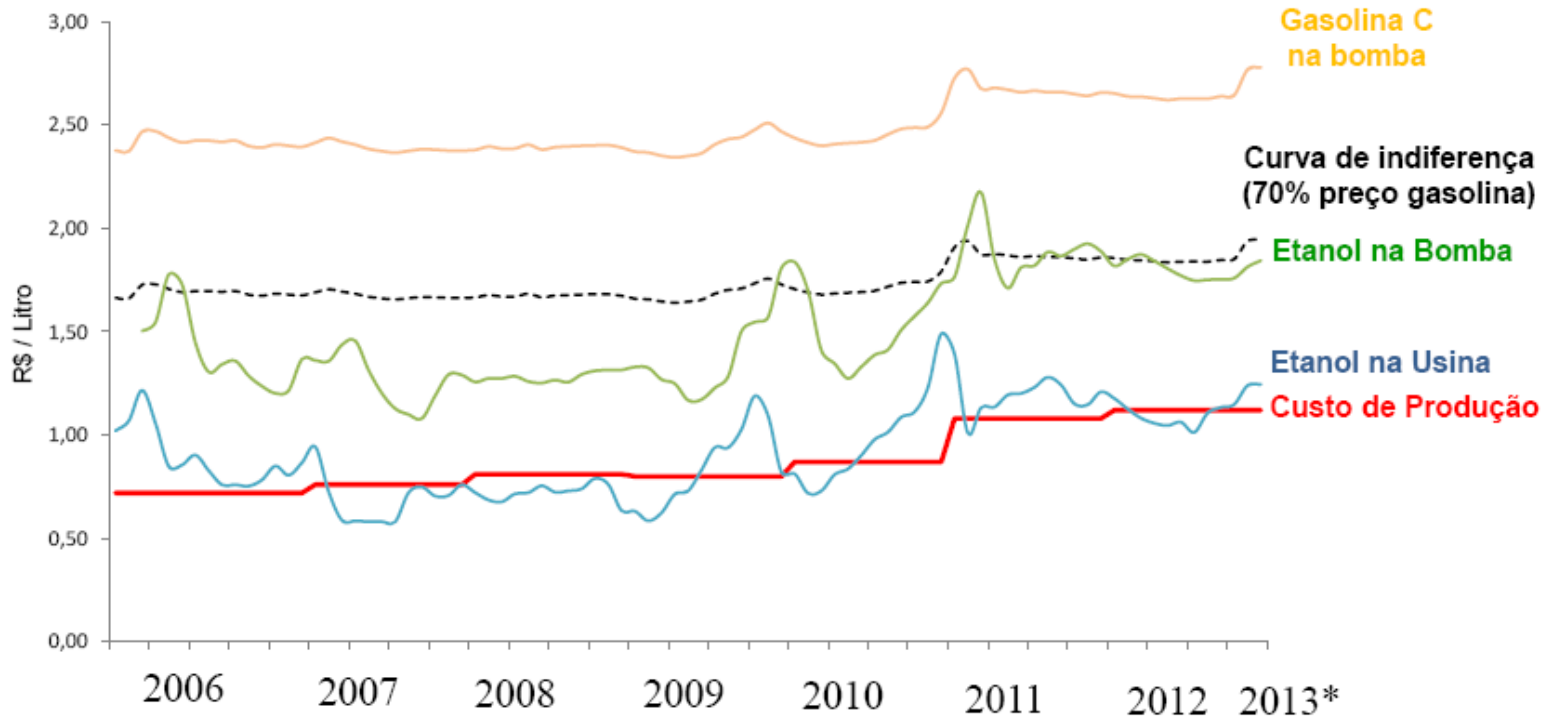
Impacts of Government Policies

- On ethanol
 - 1931: mandate 5% blend on imported gasoline
 - 1975: Proalcool Program – subsidies, parity prices of ethanol with sugar and gasoline, support to increasing blend ratio and neat (100%) ethanol vehicles
 - 1986: oil shock – decreasing subsidies and stagnation of ethanol production
 - 2000: end of government control in the sector
 - 2003: FFV supported by government policy
 - 2005 to present: government subsidizes gasoline
- On sugar
 - 1933: created IAA that controlled all production and prices (including ethanol)
 - 1990: closed IAA and initiate the sector deregulation
- Conclusions:
 - Sugar-ethanol sector grew when industry was allowed to respond to markets and government price controls were removed
 - Government support policies (e.g. favoring FFVs) are important, especially in the initial phase of the program

Transport Fuel Consumption in Brazil

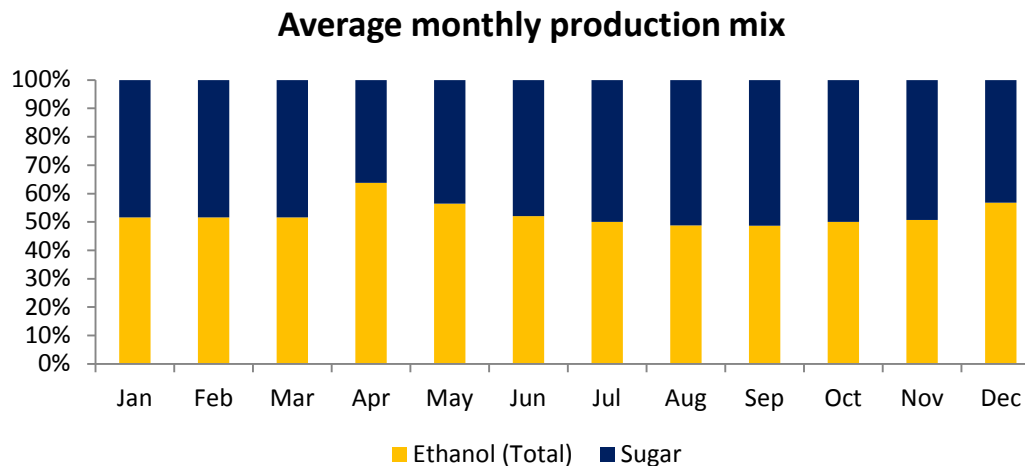
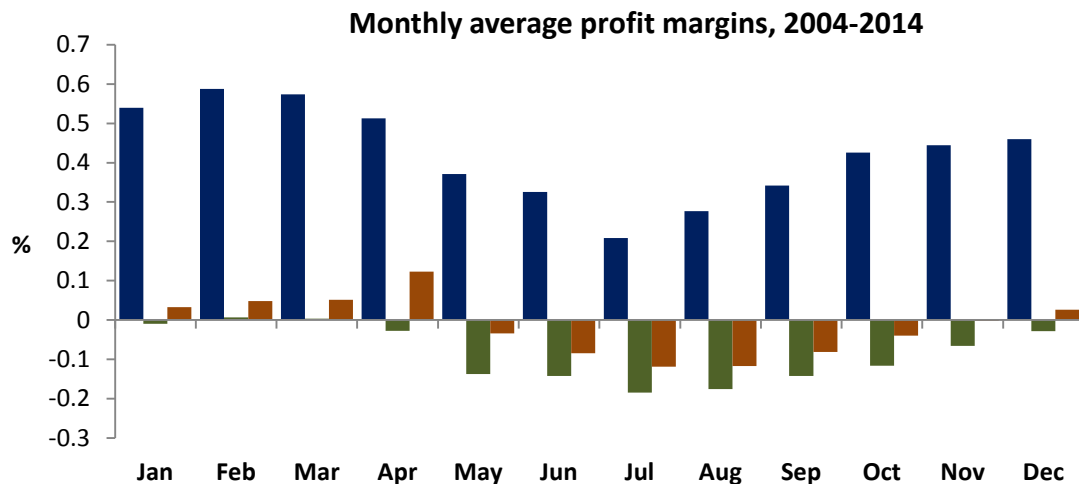


Source: M. Jank, 2013



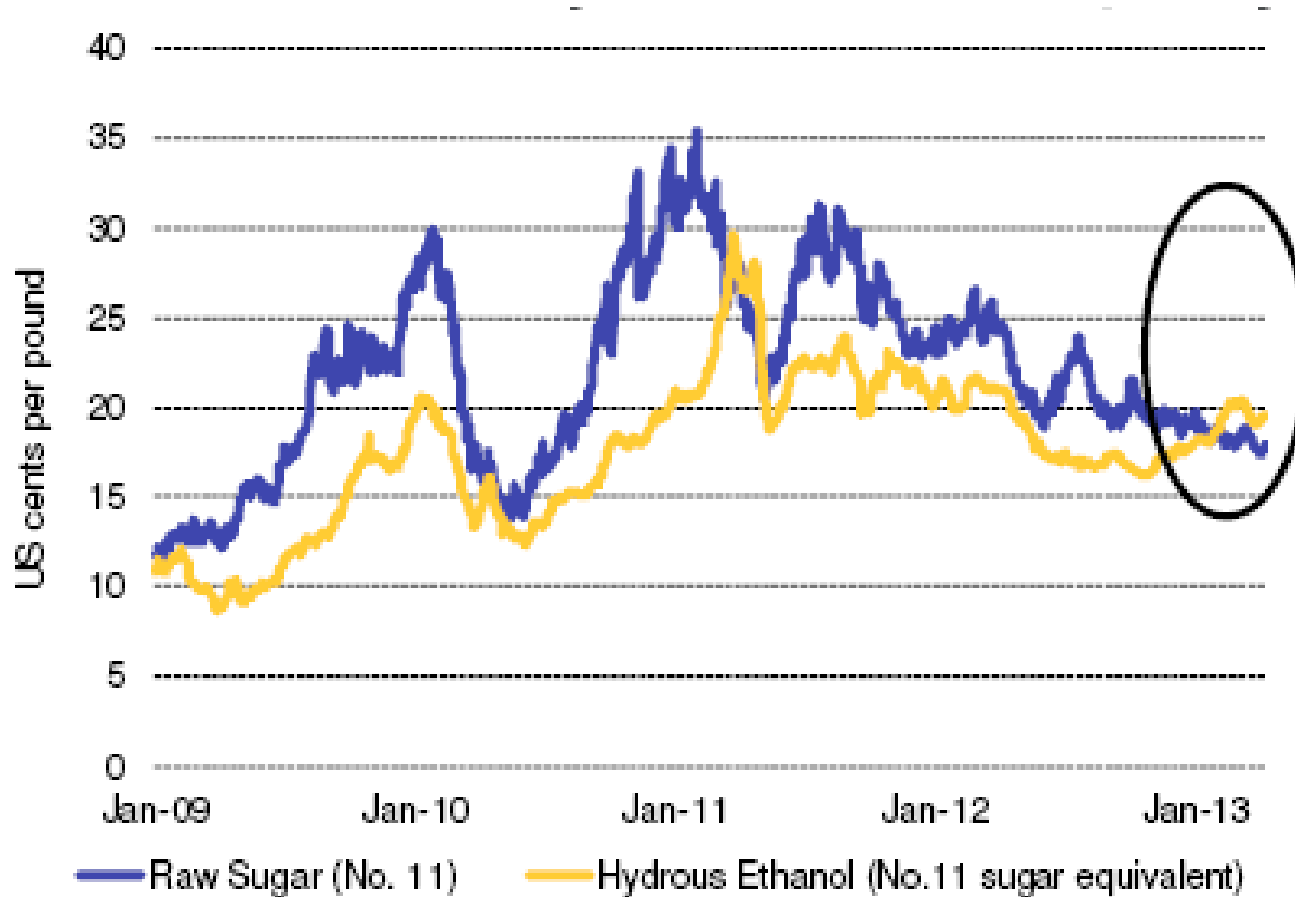
- Desde 2006, a relação de preços com a gasolina se tornou um limite virtual no preço do etanol.
- Ausência de transparência na política de precificação da gasolina afasta investimentos para expandir a produção de etanol.

Sugar and Ethanol Margins and Mix (2007-2014)



Source: Capitani, 2014

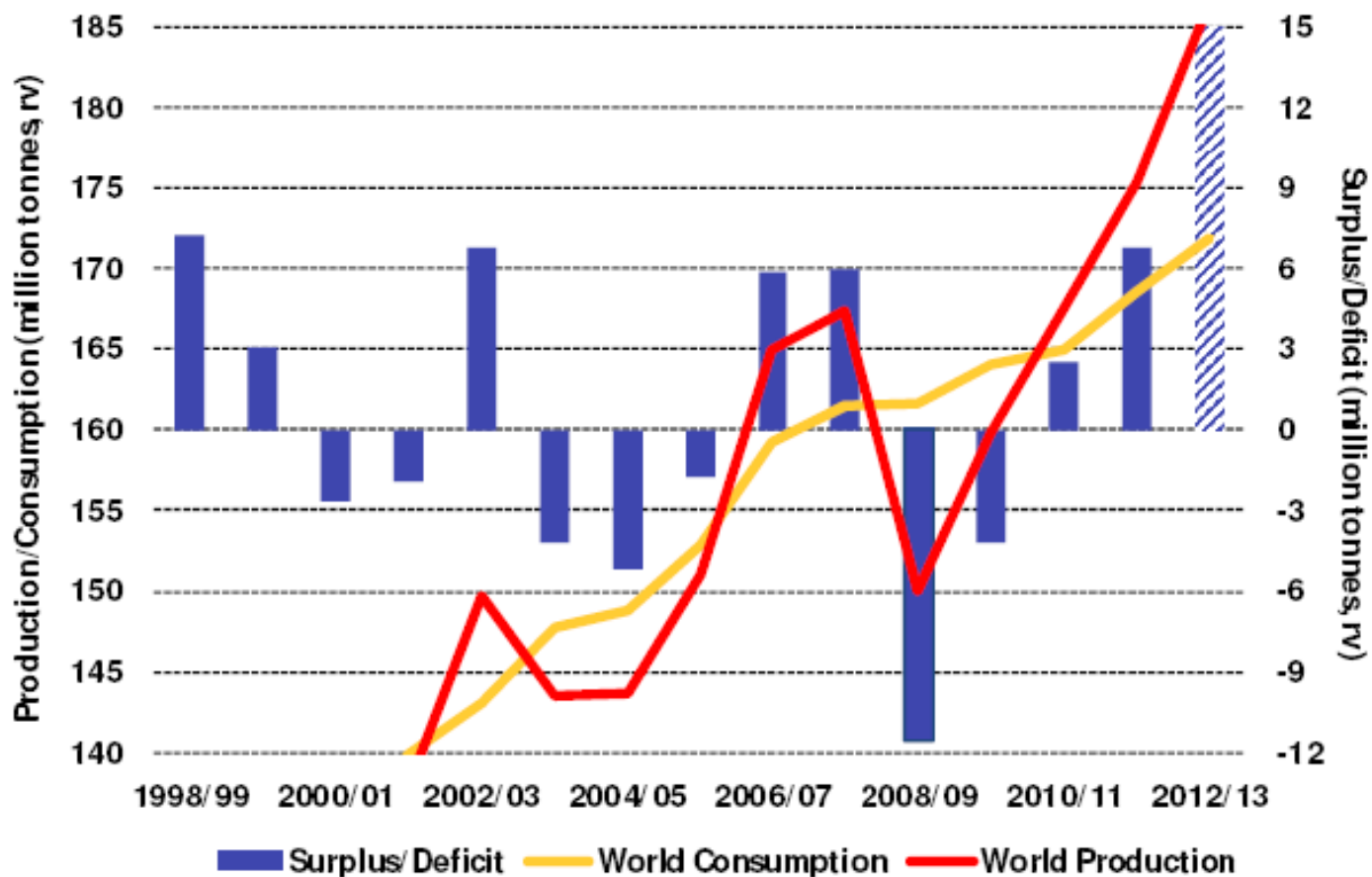
World Sugar Prices and Hydrous Ethanol Parity



Source: LMC International, 2013

International Sugar Supply and Demand

Global supply/demand balance (Oct/Sep crop year)



Source: LMC International, 2013



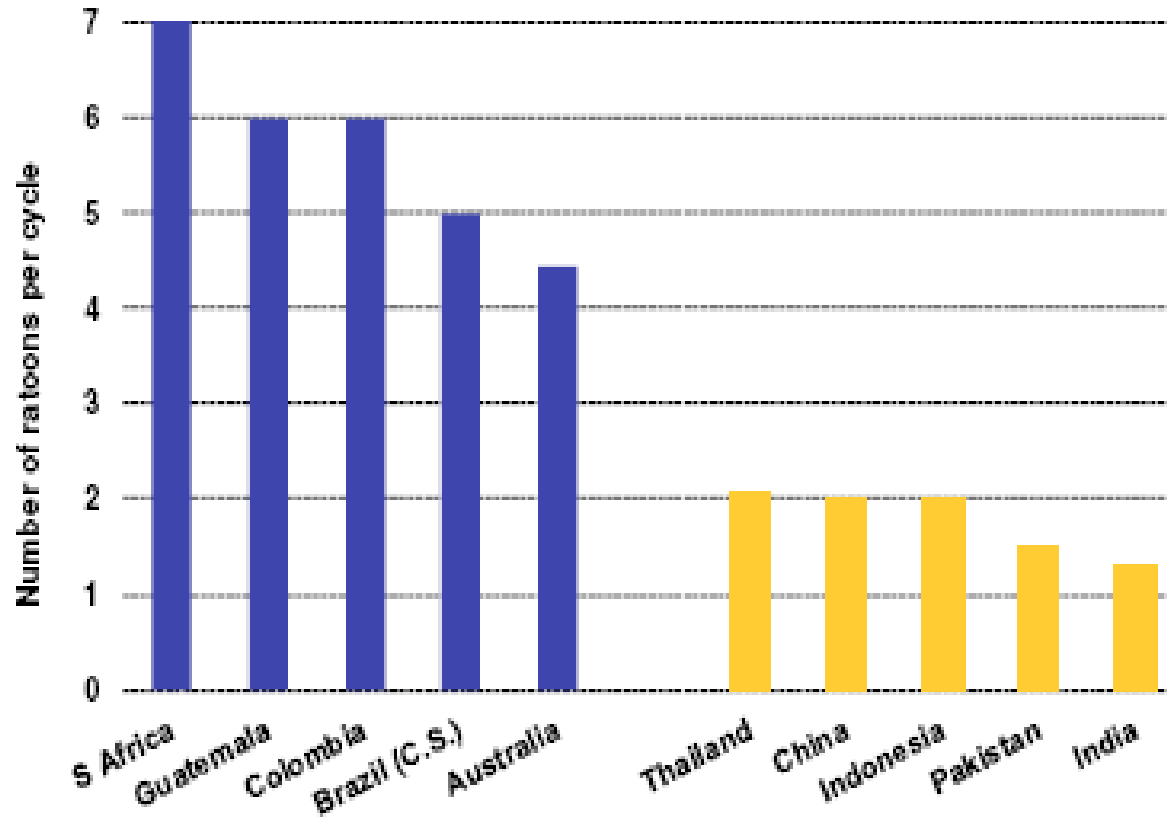
How Do Sugar Producers Respond to Prices?

It depends on

- The alternative crops
- Ratoon cycle

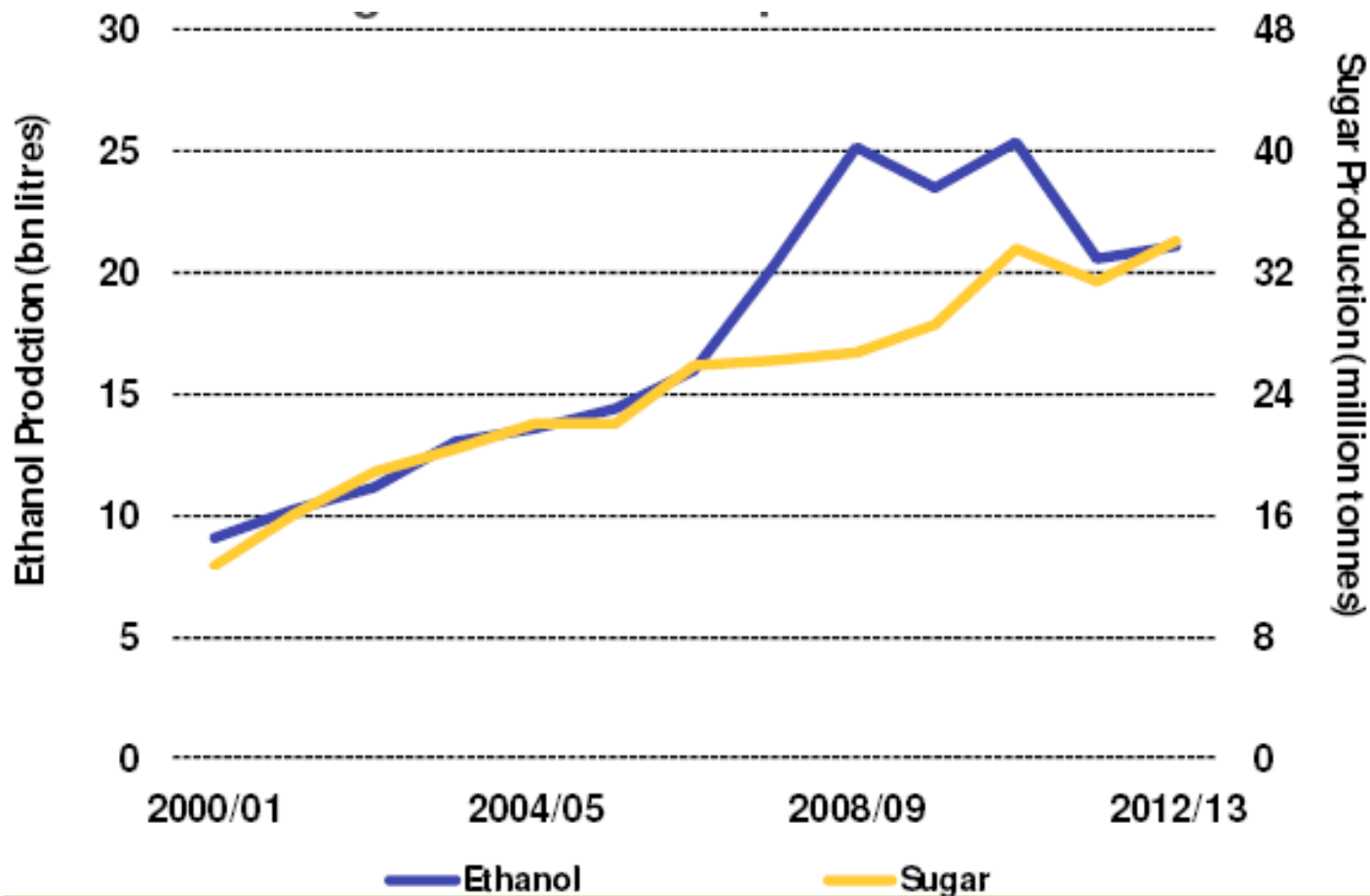
There are significant differences among producing countries with respect to these two cases

Ratoon Cycle in Different Countries



Source: FMC International, 2013

Sugar/Ethanol Production in C/S Brazil



Final Comments (1)

- Government policies dominated the sugarcane sector in Brazil from 1933 to 1991 (for sugar) and until 2000 (for ethanol): established production quotas, prices and export
- Today, government can influence markets through control of mandated blending rate for ethanol in gasoline
- Government is having significant impact via control (subsidies) of the price of gasoline (1st time)
- Government can also adjust taxes (not done very often)
- Ethanol prices have a cap represented by the parity price with gasoline (70% of gasoline price) and helps to bring down the sugar parity price in the international market
- Government can set tariffs, duties and taxes or create other incentives to produce, export or retain, sugarcane products, but has not intervened through these mechanisms lately



Final Comments (2)

- Sugar sector suffered overproduction and lacked competitiveness over most of 20th century despite government intervention
- Pro-Alcohol Program had significant impacts on investment, technology and improvements (cane breeding, management, processing efficiency, etc.)
- Government and industry contributed to infrastructure improvements that were critical for socio-economic development (ports, railroads, communications, etc.)
- Sugarcane feedstock represents 2/3 of total final product costs (ethanol or sugar) so improvements in sugarcane genetics and management has been very influential in competitiveness
- Sugar and ethanol in Brazil are partners not competitors for the same feedstock

- 3. Change policies so they adjust biofuel production in response to food crises? This assumes quick adjustment can free food for distant lands, but:**
- Brazil has limited capacity to adjust processing at mills each season
 - The ethanol-sugar mix is already driven by market prices so policy does not need to change
 - Adjustments are unlikely to affect food availability in distant nations suffering food crisis



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Thank you!

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