

**Escola Superior de Agricultura “Luiz de Queiroz” – ESALQ/USP**



Advanced School on the Present and Future of Bioenergy

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## Topics

- Brazilian Ethanol Program: a brief overview
- Sustainability: social agenda
- Socioeconomic indicators

- Brazilian National Ethanol Program – Proalcool – was launched in 1975 by the military government
- Since then we produce and use sugarcane ethanol as a fuel in a large scale
  - anhydrous (mixed to gasoline)
  - hydrous (automobiles powered by hydrous ethanol and on flex fuel cars)
- **The main motivation of the Proalcool was economic**
  - At that time Brazil was still heavily depended on imported oil and was badly hit by the 1973 and 1979 oil shocks, with serious effects on the country's trade balance and inflation
- Brazil adopted two strategies:
  - Increasing exploration and production of oil
  - Stimulating the production of anhydrous ethanol, to be mixture to gasoline (First Phase of Proalcool)
  - Replacing part of gasoline consumption with *hydrous ethanol* (Second Phase of Proalcool)
- **The policy to *replace oil* was the main driver of Proálcool**

Two main conditions enabled the creation of Proalcool

### 1) robust production of sugarcane and sugar tightly regulated by the government

Since the 1930s, the government:

- established production levels for sugar and ethanol for each plant
- fixed the prices for sugarcane, sugar, and fuel ethanol
- controlled all sales and exports of sugar
- Regulate the relationship between sugarcane suppliers and industrial units
  - **There was a very intensive control over the sectors**

### 2) military regime that was in place at the time

- whose decision-making and enforcement powers were quite broad, making it easier to coordinate the activities of the various stakeholders and sectors involved

- From the second half of the 80: the political system changed from military regime to a democratic one
- Federal government initiated an administrative reform aiming an economic liberalization in Brazil:
  - privatizations, deregulation of various agricultural productive chains – milk, coffee, wheat, sugarcane
- Deregulation on the sugarcane, sugar and ethanol sectors:
  - Strong Impacts on sugarcane, sugar and ethanol sectors
  - Main changes:
    - on the system of pricing of sugarcane, sugar and ethanol
    - on production controls and crop plans previously issued by the government
    - on policies designed to support the production of sugarcane and ethanol
    - on the activities of the stakeholders themselves, including the government (at the federal and state level)
- Deregulation: affected the relationships among the actors along the entire production chain
  - sugarcane suppliers; sugar mill owners; ethanol plant owners; fuel distributors; consumers of sugar and ethanol, government



# The post-deregulation period



The free market: the profound changes and the new agenda

- Mergers and acquisitions process;
- International capital inflow;
- Expansion of electric energy co-generation;
- Investments in new process and products from sugarcane
- ***New social and environmental agenda***

# Sugarcane Production Chain: Main Agents

## Sugar Cane Fields

70,000 sugarcane growers



25% harvest manually and 75% mechanically

**439,922 employees**



## Industrial Sugar and Ethanol Production

**400 Sugar Mills/Ethanol Distilleries**



**600,000 employees**

### **Sugar cane field**

✓ The sector comprises 70k independent producers, accounting for 40% of national sugarcane production

✓ 60% of sugarcane comes from self supply of vertically integrated mills

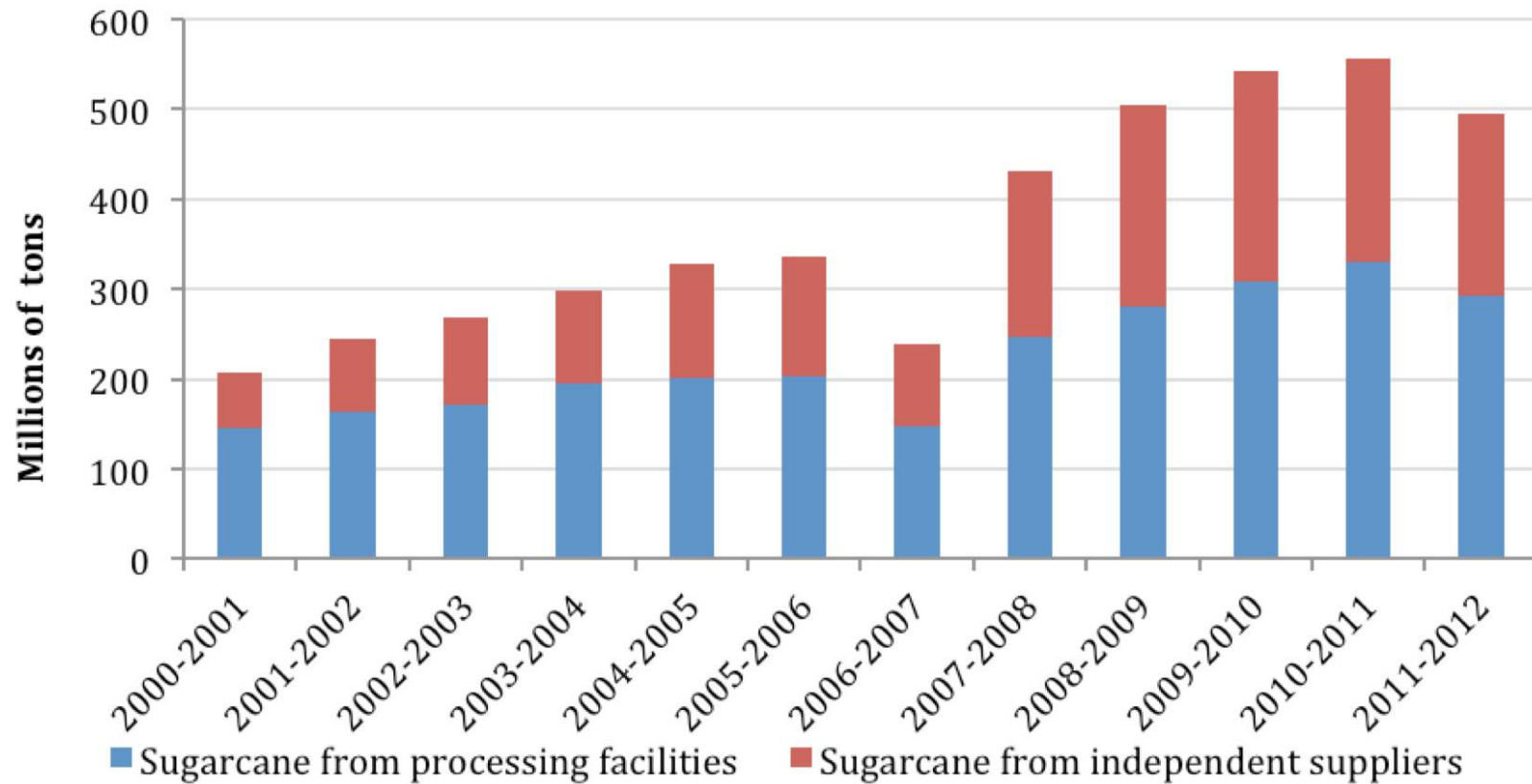
(mills have sugarcane fields plus processing plants)

Sugarcane processing plants in Brazil can produce sugar and/or ethanol

By products:

- Vinasse: used as biofertilizer
- Bagasse: electrical power generation
- all plants are self sufficient in electric power
- most efficient sell the energy surplus to the market

## Post-deregulation period Sugarcane sector



Sugarcane suppliers currently account for approximately 40% of all sugarcane processed for the production of sugar and ethanol in Brazil (MAPA, 2012)



Profile of independent suppliers and rural partners in the 2011–12 harvest season, registered in the TRS System database maintained by the CONSECANA-SP

Quantity of sugarcane produced	Number of sugarcane suppliers	Proportion of the total Number of suppliers	Average farm size (ha)	Overall production (tons)	Proportion of total production
≤ 1,000 tons	8,889	45.9%	8	4,945	4.2%
1,001–6,000 tons	7,672	39.6%	46	24,868	21.0%
6,001–12,000 tons	1,459	7.5%	156	15,891	13.4%
12,001–25,000 tons	786	4.1%	310	17,049	14.4%
25,001–50,000 tons	366	1.9%	634	16,266	13.7%
50,001–100,000 tons	123	0.6%	1,284	11,022	9.3%
> 100,000 tons	87	0.4%	4,484	28,296	23.9%
<b>Total</b>	<b>19,382</b>	<b>100.0%</b>	<b>86</b>	<b>118,336</b>	<b>100.0%</b>

Source: Consecana SP

- From 2005 onward, there were improvements in the environmental and social indicators, as well as in working conditions in the national sugarcane, sugar and ethanol sectors
- There was also greater compliance with the existing labor standards
- Several factors can explain the better working conditions nowadays:

**(i) Banning the practice of pre-harvest burning of sugarcane fields**

- The harvest process of green cane (besides being more environmentally sustainable) is now done mechanically, which improved the working conditions and demanded employees with higher education .
- Also with the adoption of mechanical harvesting decreased the migration of workers from poorer states of Brazil, which used to come to harvest sugarcane by hand in the state of São Paulo

## (ii) Improving compliance with environmental and labor standards

- As of 2007, given the prospects for increased biofuel production in several countries, fuels made from agricultural raw materials began to receive criticism
  - There has been a considerable increase in the importance of the socio-environmental agenda, and the increasing need to comply with internationally environmental and social standards
  - multinational and national companies of the food and beverage sectors, big sugar consumers, increased certification requirements of the supply chain, which also had a positive impact on social indicators of the sugarcane sector
  - compliance with environmental and social requirements has begun to influence the strategies and investments in the ethanol sector, which seeks to export ethanol to the United States and the European Union

## **(iii) Increase in exports of sugar in the international market**

- Competitors of Brazil in the international sugar market (especially the EU countries) began to question the competitiveness of domestic production, claiming that Brazil had lower production costs because it degraded the environment and had inadequate working conditions.
- Although these were not the factors of lower cost of Brazil, certainly influenced companies to adopt best practices and certify production.

## (iv) opening of the Brazilian economy and foreign capital inflows

- Foreign capital entered in the sugar and ethanol sectors in 2000
  - 2000: French groups Louis Dreyfus, Tereos, and Sucden having acquired ethanol plants in Brazil that year
  - After 2007 there was a greater influx of foreign investment
    - largely came not only from sugar-producing companies in other countries (such as Shree Renuka Sugars, India's largest sugar refiner), but also from companies with extensive experience in the production and trading of agricultural commodities, such as Bunge Limited, Cargill, Louis Dreyfus, Tereos, Abengoa, Glencore, and the Noble Group
    - large oil companies (Shell, British Petroleum, Petrobras)
- Adoption of better environmental and social practices

## iv) Mergers and acquisitions

- It was observed a process of consolidation and there were profound changes in the organization of production
  - Intense process of professionalization of management, which can be attributed in part to the new players in the industry
  - New technologies and new forms of coordination of the production chain, as well as production management systems that are economically and environmentally more efficient, have been adopted, in order to meet the growing list of sustainability criteria required by the market.

## Laws and International Conventions Labor Framework

- There is an extensive legal and regulatory apparatus governing the Brazilian labor market, covering all sectors of the economic activity, including workers in the sugarcane, sugar and ethanol sectors
  
- The main regulations for the labor market in Brazil are:
  - (i) The Federal Constitution;
  - (ii) Consolidation of Labor Laws (CLT),
  - (iii) Rural Workers' Law (5889/73);
  - (iv) Law No. 10.192/2001 that establishes the wage policy.
  
- The organization of workers' unions is covered in article 5 of the Federal Constitution

## 1. Social indicators in sugarcane, sugar and ethanol production

- Job creation
  - large number of people
  - inclusion of *low schooling* workers
- Official employment (formal contracts)
- Job penetration: production spread all over the country



# Database

## **PNAD - National Household Sample Survey**

- Conducted by the Brazilian Institute of Geography and Statistics (IBGE) - (Federal Government )
- Annual Survey of socioeconomic information on *formal and informal* workers
- Obtained through questionnaires applied to a sample number of households
- Data available for sector of activity - state level

## **RAIS - Report of Social Information**

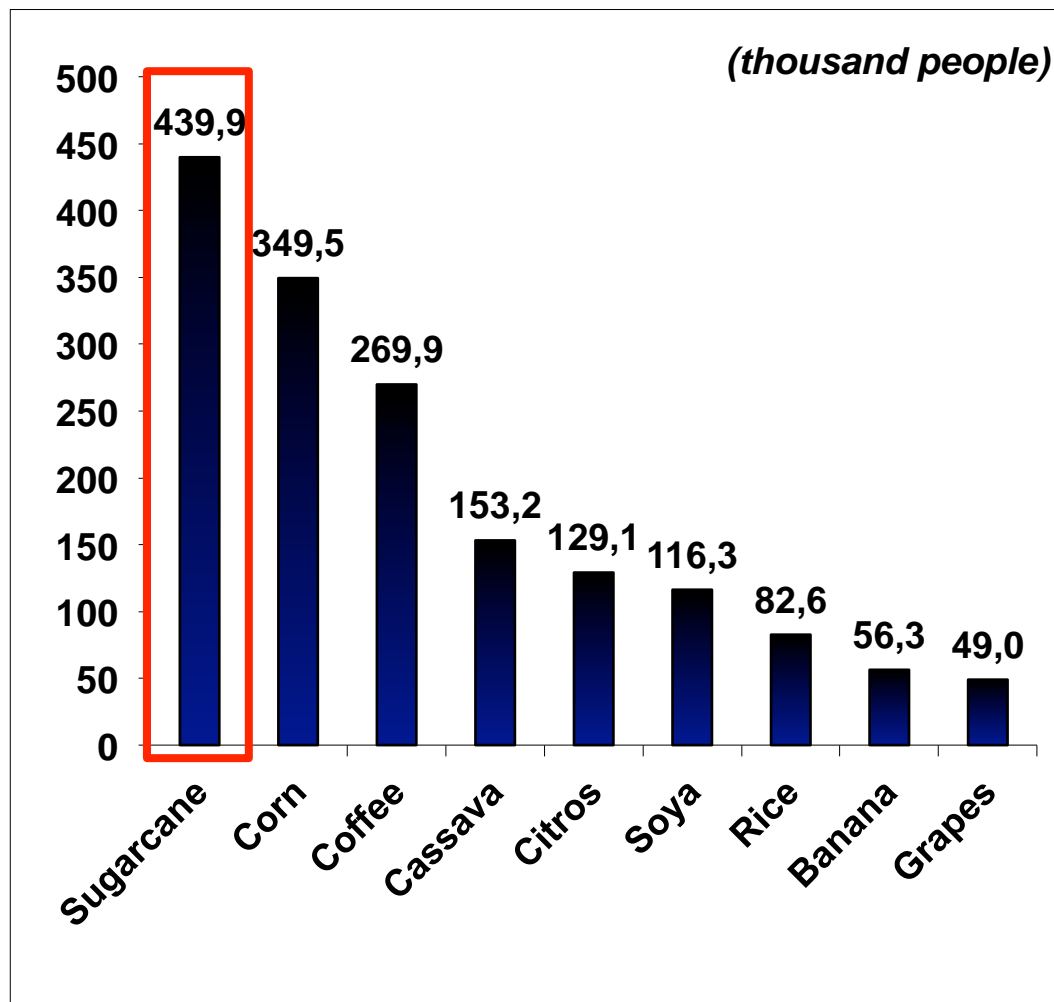
- Conducted by the Brazilian Ministry of Labor
- Annual census on the *formal* labor market based on information provided by companies
- Data available for sector of activity – municipality level

## Number of formal workers by producing regions and sector 2012

	Region	2012
Sugarcane	NNE	74,484
	CS	256,226
	<b>Total for Brazil</b>	<b>330,710</b>
Sugar	NNE	230,443
	CS	322,431
	<b>Total for Brazil</b>	<b>552,874</b>
Ethanol	NNE	45,232
	CS	162,759
	<b>Total for Brazil</b>	<b>207,991</b>
<b>Total for Brazil 3 sectors</b>		<b>1,091,575</b>

Source: Prepared based on data provided by RAIS, 2012

## 2,258,276 agricultural workers in Brazil



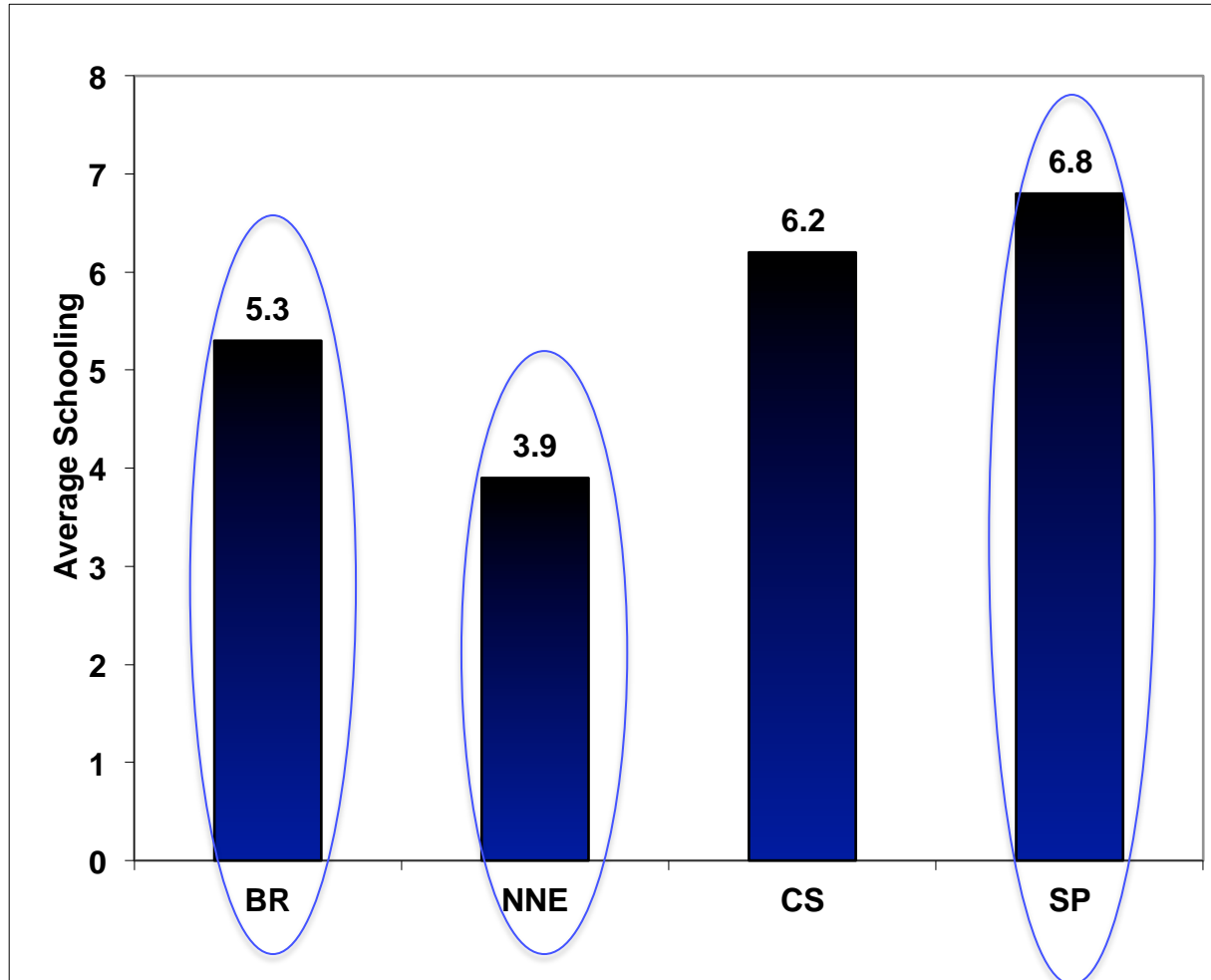
✓ Sugarcane employees accounts for almost 20% followed by corn (15.5%) and coffee (12%)

✓ Sugarcane:

✓ very impressive number

✓ inclusion of many low schooling people

## Agriculture: 4 years of study



- ✓ The average schooling of agriculture workers is 4 years of study
- ✓ Sugarcane: 5.3 years of study is the average, considering both regions
- ✓ NNE region has lower education level
- ✓ The state of São Paulo has the highest level: 6.3 years of school, which still is very low

✓ 20.8% (about 90k workers) are illiterate

# Sugarcane: Number of Employees and Wages. 2012

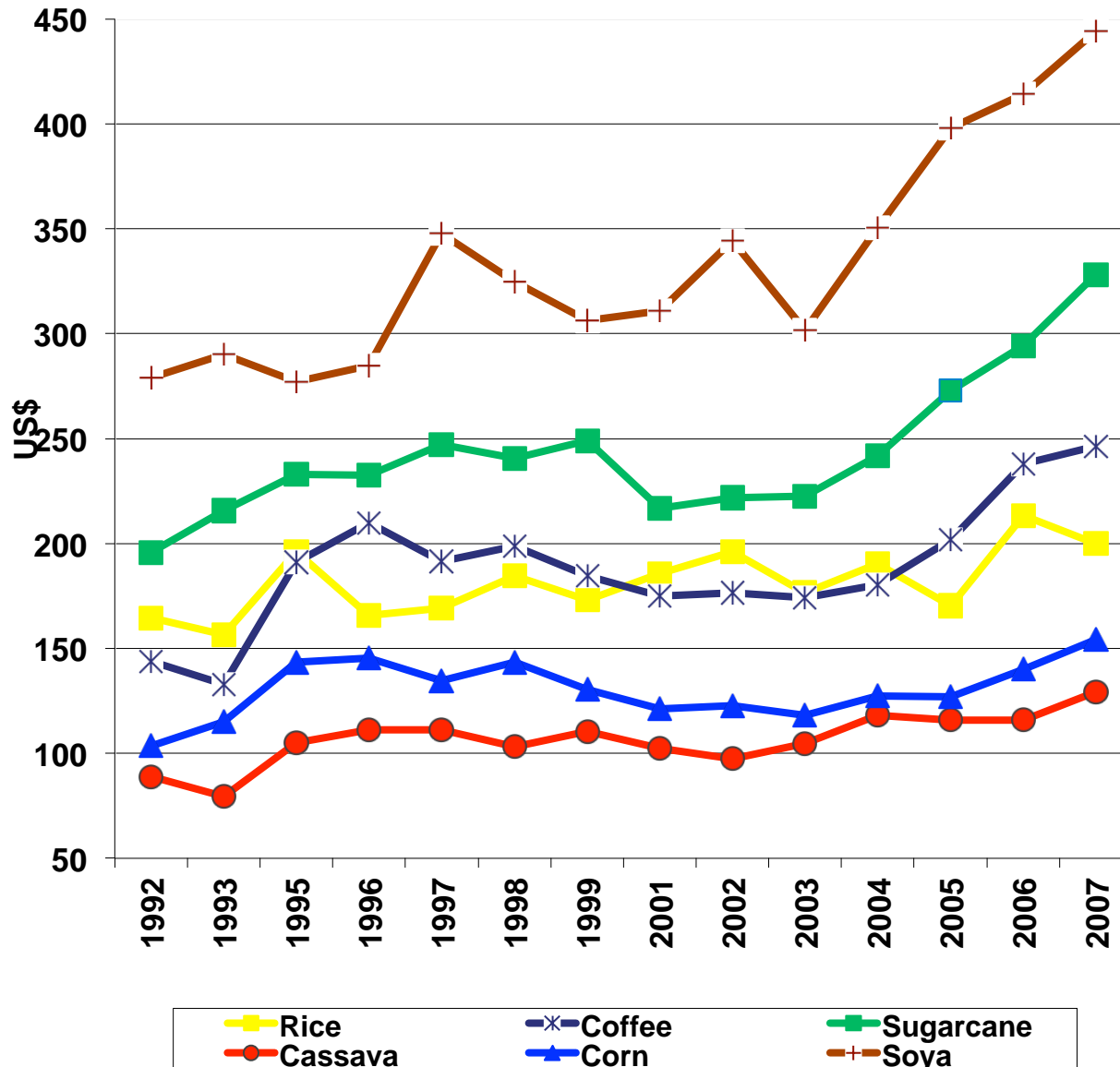
- ✓ Workers in the sugarcane sector in the state of São Paulo earned the highest salaries
- ✓ Higher years of schooling
- ✓ Higher proportion of mechanized activities

	Number of Workers	Montly average salary (US\$)
BRAZIL	463,046	417.64
NNE	181,526	298.68
CS	281,520	495.40
SP	156,191	534.95

in US\$ 2012

Source: Prepared based on data provided by PNAD 2012

# Wages: sugarcane and other crops



✓ The wages of soya sector are the highest ones  
 ✓ Earning Equation estimated showed that:

- ✓ After the control of other variables that influence wages:
- ✓ Schooling
- ✓ Age
- ✓ region,
- ✓ color,
- ✓ gender, etc

The average monthly wage of other crops workers in comparison with sugarcane wages are:

- Coffee: 9,9% lower;
- Cassava: 23,2% lower;
- Corn: 30,1,% lower;
- Soya: 0,2% lower ;
- Rice: 30,1% lower

## ➤ Rules and Norms

### **Norms: federal, state and municipal**

- Federal Decree # 2.661, July/1998
- **SP state**
  - State Decree # 42.056, 1997
  - State Decree # 28.848, 1988
  - State Decree # 10.547, 2000:
  - State Law # 11.241, 2002 – Deadlines for the end of Sugarcane Burning
    - Mechanized areas (flat): 2021
    - Non mechanized areas: 2031

### **Environmental Protocol**

- June, 2007: SP state and UNICA signed a cooperation Protocol
- Although non mandatory, producers' adhesion was close to 100%

New deadlines for sugarcane burn halt are:

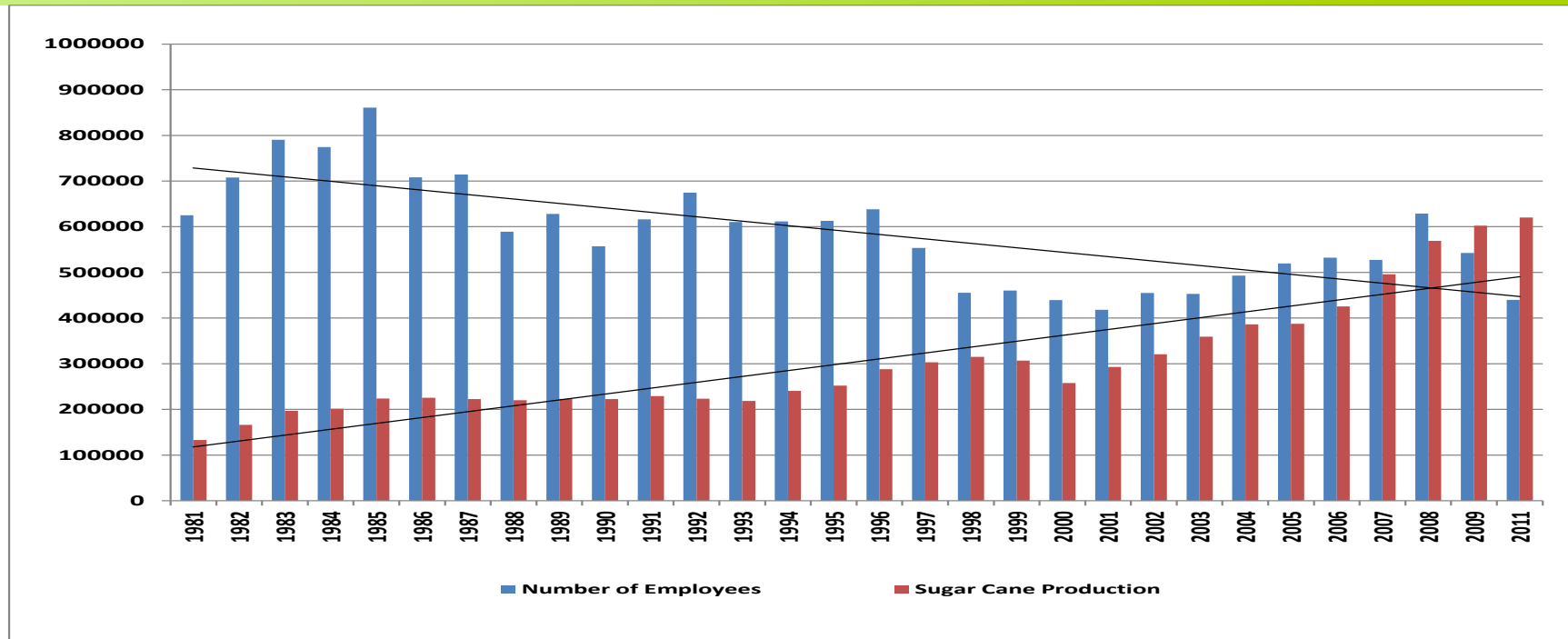
- ➡ Flat areas: 2014
- ➡ Non flat areas: 2017

- Burnt sugarcane (manual harvesting) x green cane (mechanical)
  - green cane: it is more efficient the usage of mechanized harvesting
- Prohibition of sugarcane burning: constitutes an advance in environmental terms
  - it demands fewer workers (one harvester substitutes about 80 workers)
  - it changes the worker's profile
    - it requires training and qualifying programs





## Evolution of the Number of Employees and of the Sugar Cane Production



➤ Sugarcane production: positive trend

Source: Prepared based on data provided by PNAD

➤ Number of Employees: different trends during the period

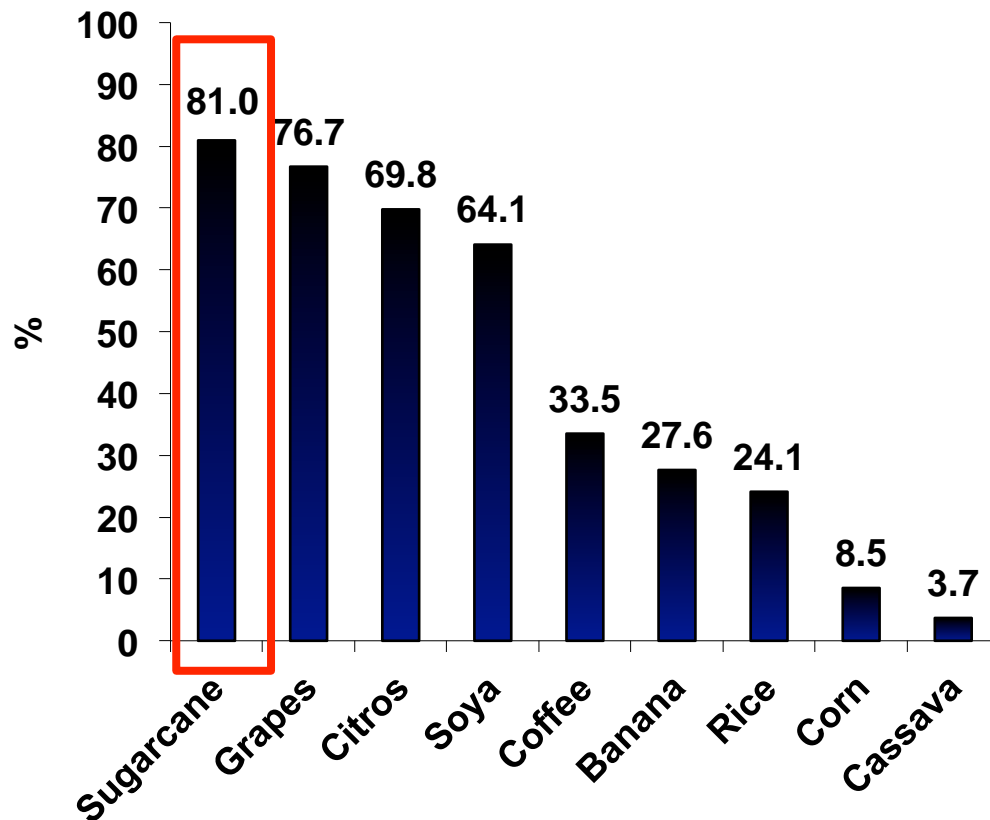
➤ Negative trend in recent years

➤ The ban on burning sugarcane fields accelerated the harvest mechanization

➤ reducing the demand for labor and also changing the profile of the workforce:

➤ more years of schooling and specific training, related to the mechanical harvesting activities.

**Agriculture**  
**40.0%**



Source: Prepared based on data provided by PNAD 2011

✓ The proportion of workers who are formally employed in the Brazilian agriculture is very low: 40%

✓ Sugarcane shows the best indicator:

✓ about 81% of the employees are formally hired

✓ The state of SP has a very impressive proportion of formally hired workers: 92%

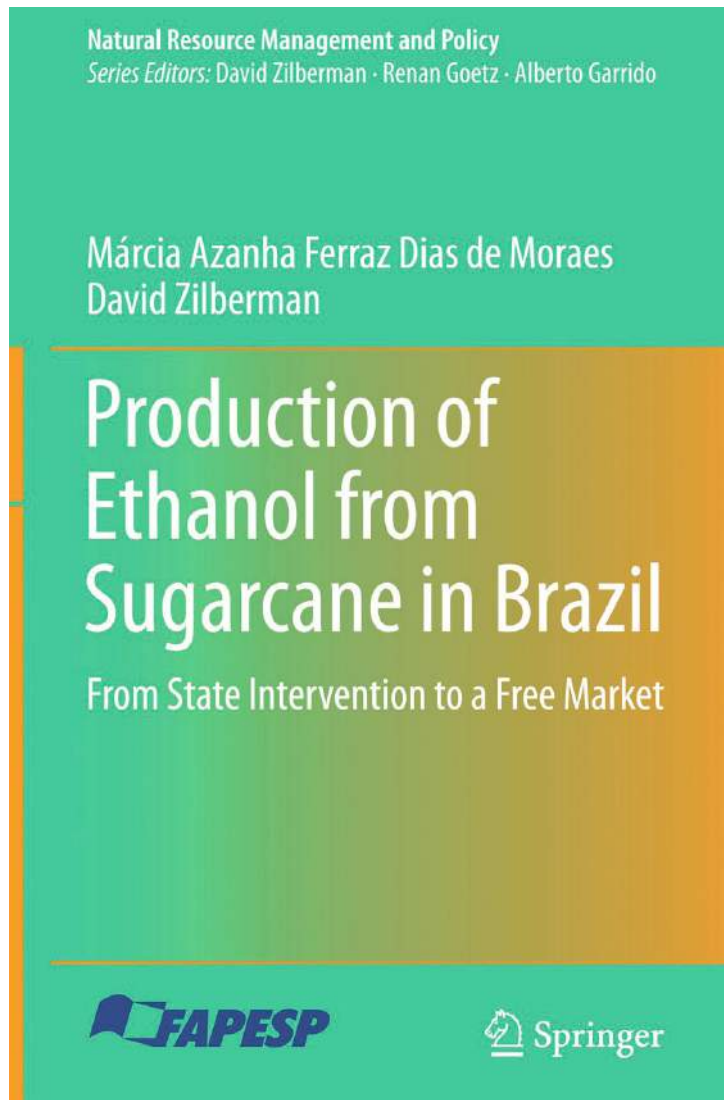
✓ These employees have all labor rights established in the legislation:

✓ access to retirement, Social Security, elimination of child labor, protection or insurance against unemployment, among others, improving quality employment

## Socioeconomic aspects of the Brazilian production

- Solid institutional apparatus that regulates the labor market
- Large number of jobs created in the three sectors (sugarcane crops, sugar and ethanol): surpass one million formal jobs
- Positive impacts on development of rural areas , spillover effects
- There have been an improvement of the indicators of the sugarcane:
  - Better observance to labor and environmental legislation
  - Better working conditions
  - Greater number of formal jobs in sugarcane sector
  - Reduction in underaged workers
  - Investment in training and qualification
  - Social and environmental certification programs adopted by companies
- Lessons from the Brazilian experience can be useful for new producers

## Production of Ethanol from Sugarcane in Brazil: from State Intervention to a Free Market



Book co-authored with Prof David Zilberman (UC Berkeley)

- Origin of Proalcool, the role of the military government, and the deep state intervention existing on the sugarcane, sugar and ethanol sectors at that time
- The process of deregulation occurred from the late 90s, and the challenges and changes faced by the stakeholders in a free market environment
- The new rules and changes since 2000, the international interest in alternatives to oil, the new environmental and social agendas, the financial constraints, and ultimately how we see the future of biofuels in Brazil.

## Publications

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- MORAES, M.A.F.D.; COSTA, C.C.; GUILHOTO, J.J.M.; SOUZA, L.G.A.; OLIVEIRA, F.C.R. Social Externalities of Fuels. In: Souza, E.L.L; Macedo, I.C.. (Org). **Ethanol and Bioelectricity. Sugarcane in the future of the Energy Matrix**. 1 ed. São Paulo: Luc Projetos de Comunicação LTDA, 2011, v. 1, p. 44-75.



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