

1ST BRAZIL- U.S. BIOFUELS
SHORT COURSE



**MARKETS, ECONOMICS AND
POLICIES OF BIODIESEL**

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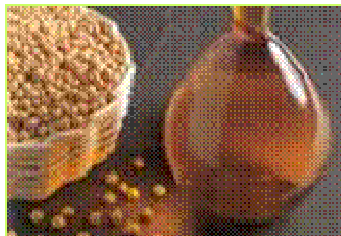
Goals

- Global economic *Biodiesel* scenario.
- Brazilian *Biodiesel* market and its regulations.
- Brazilian case in the State of Ceara.
- Conclusions.

What is Biodiesel ?

- Biodiesel is a biodegradable, nontoxic diesel fuel substitute that can be used in diesel engines
- Biodiesel is now made from

soybean



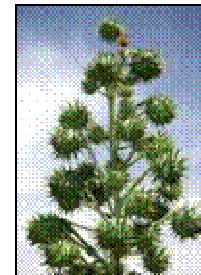
canola



palm



Castor



sunflower



Jathropa



"yellow grease"

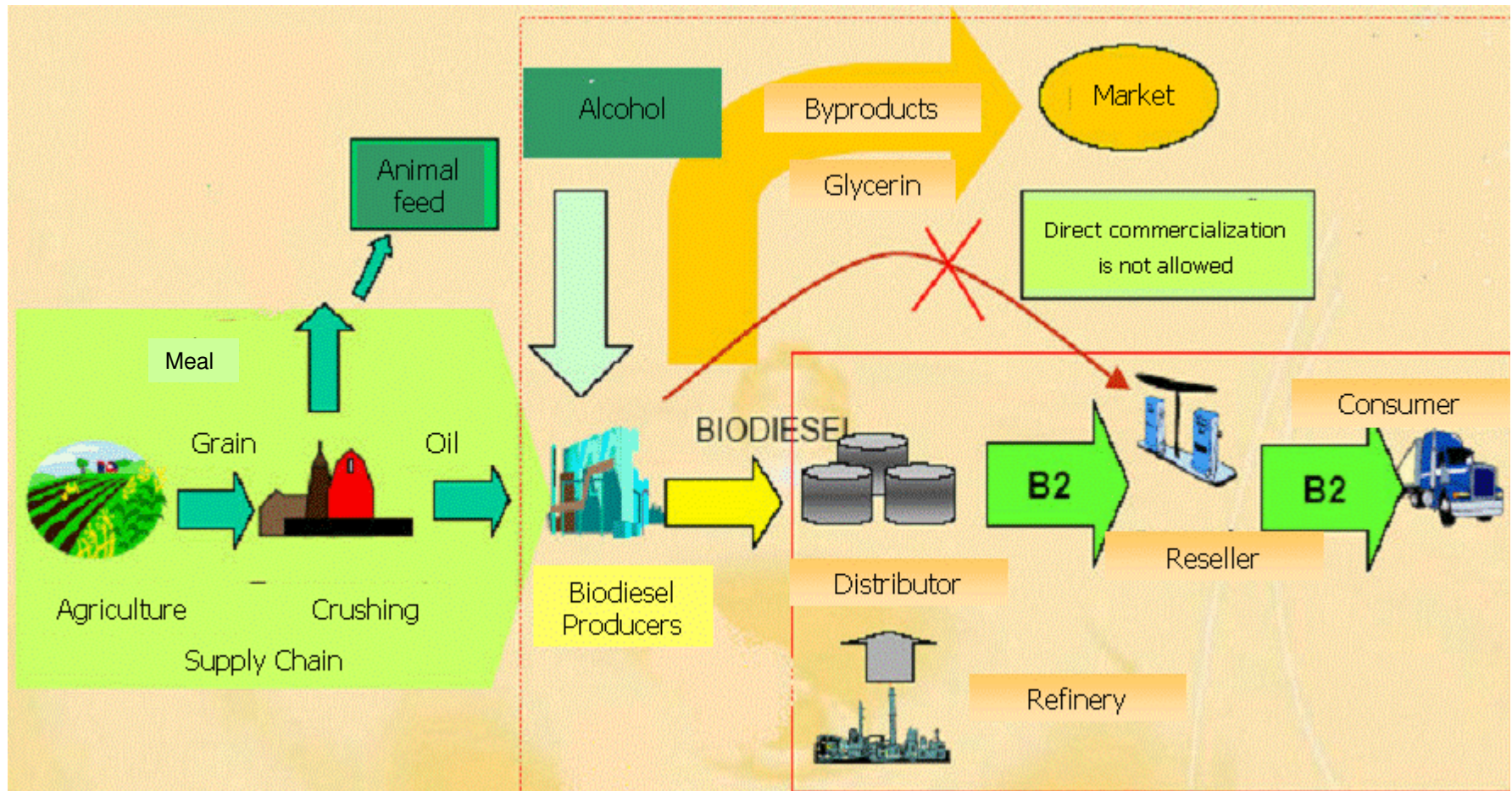


in the future ...



cellulose

Biodiesel Supply Chain





Motivation: why Biodiesel ?

- Growing demand for energy worldwide.
 - Outlook of scarcity on the supply side
 - Increasing oil prices ▶

- Importance of environmental impact
 - Burn of fossil fuels → Global warming ▶
 - Kyoto Protocol: reduced emission of carbon dioxide and nitrogen oxides
 - Need for clean energy production ▶

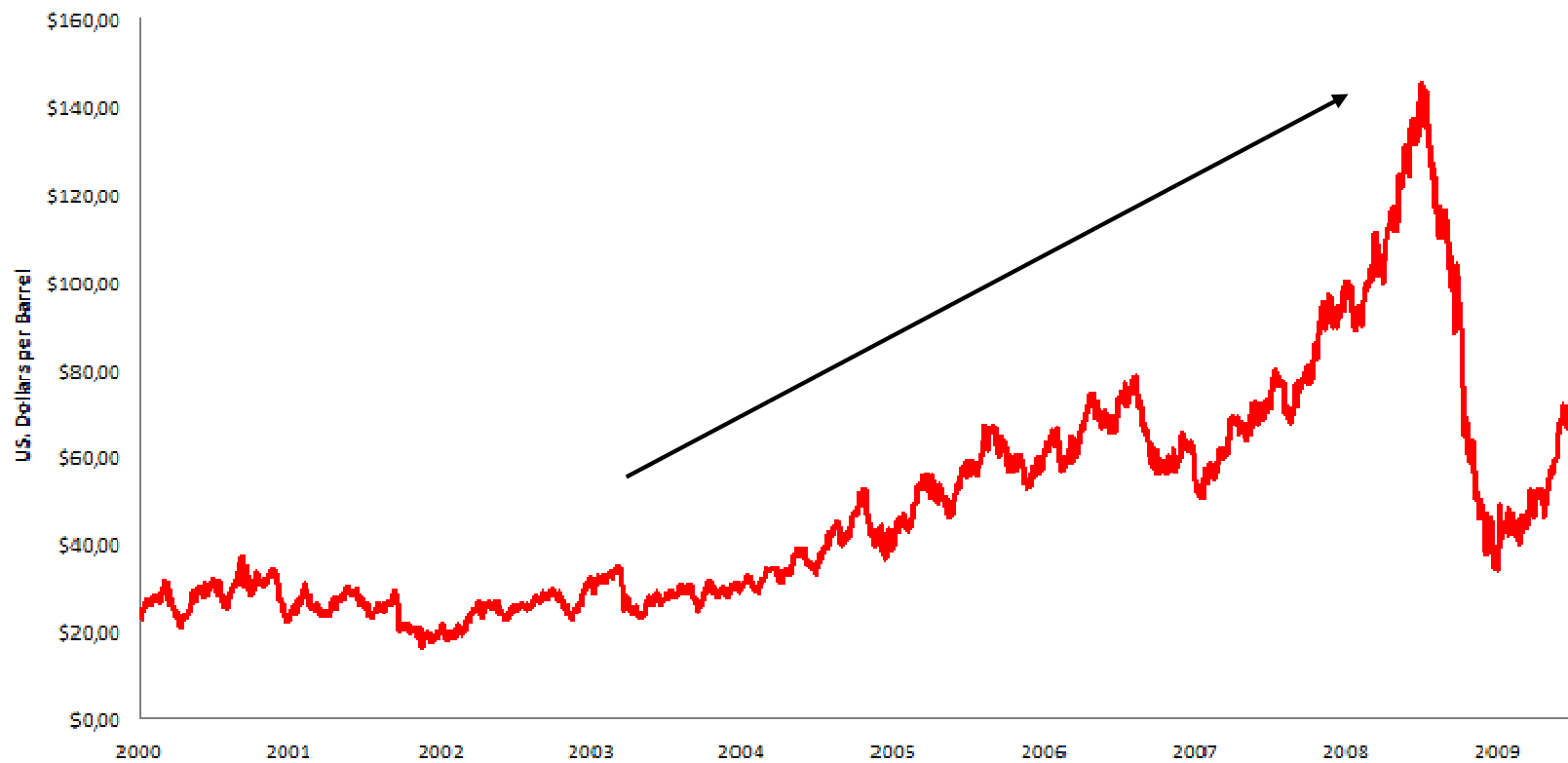
- Results (1990): inclusion of biodiesel in the world energy matrix ▶



Oil Price



Spot Prices of Brent Crude Oil

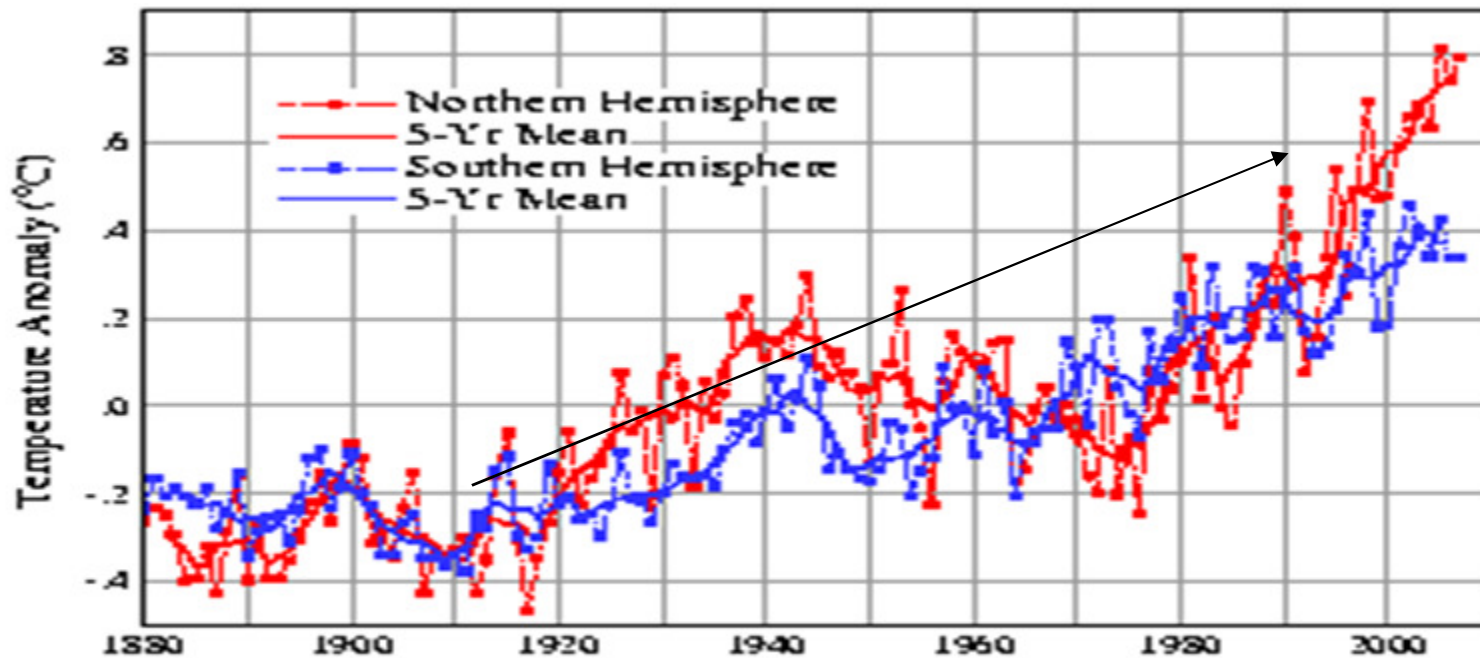


Source: EIA



CHANGES IN TEMPERATURE ◀

Temperature changes in the hemispheres



Source: NASA, 2008.



World's reliance on fossil energy ◀

Energy: fuel

35% oil
25% coal
21% gas
6% nuclear
2% hydro
10% Biomass and waste
1% other renewable sources

Energy: electricity

40% coal
20% gas
16% hydro
16% nuclear
1% oil
1% renewable

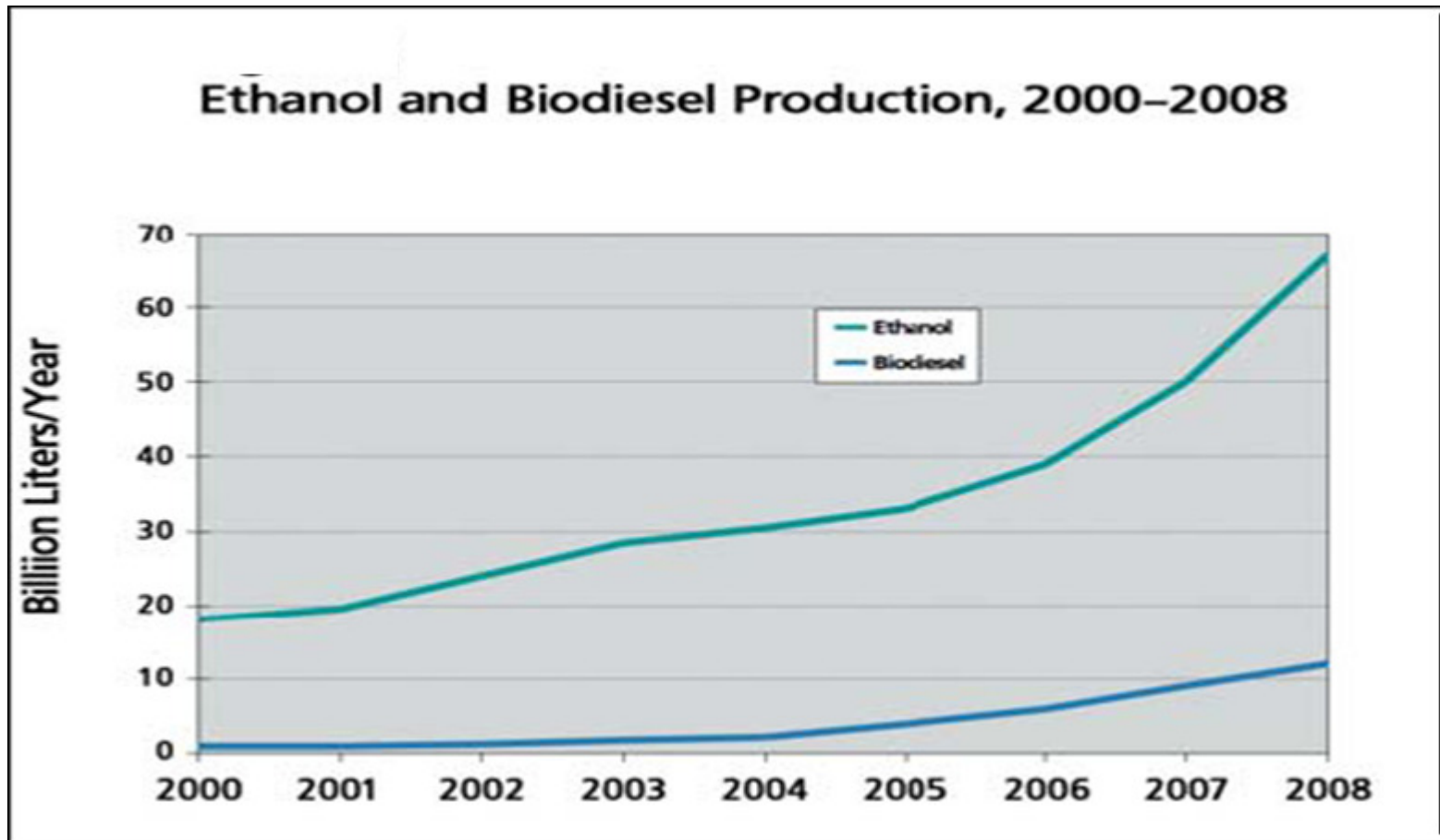
Source: Carr (2008).



BIODIESEL AROUND THE WORLD



WORLD BIOFUEL PRODUCTION

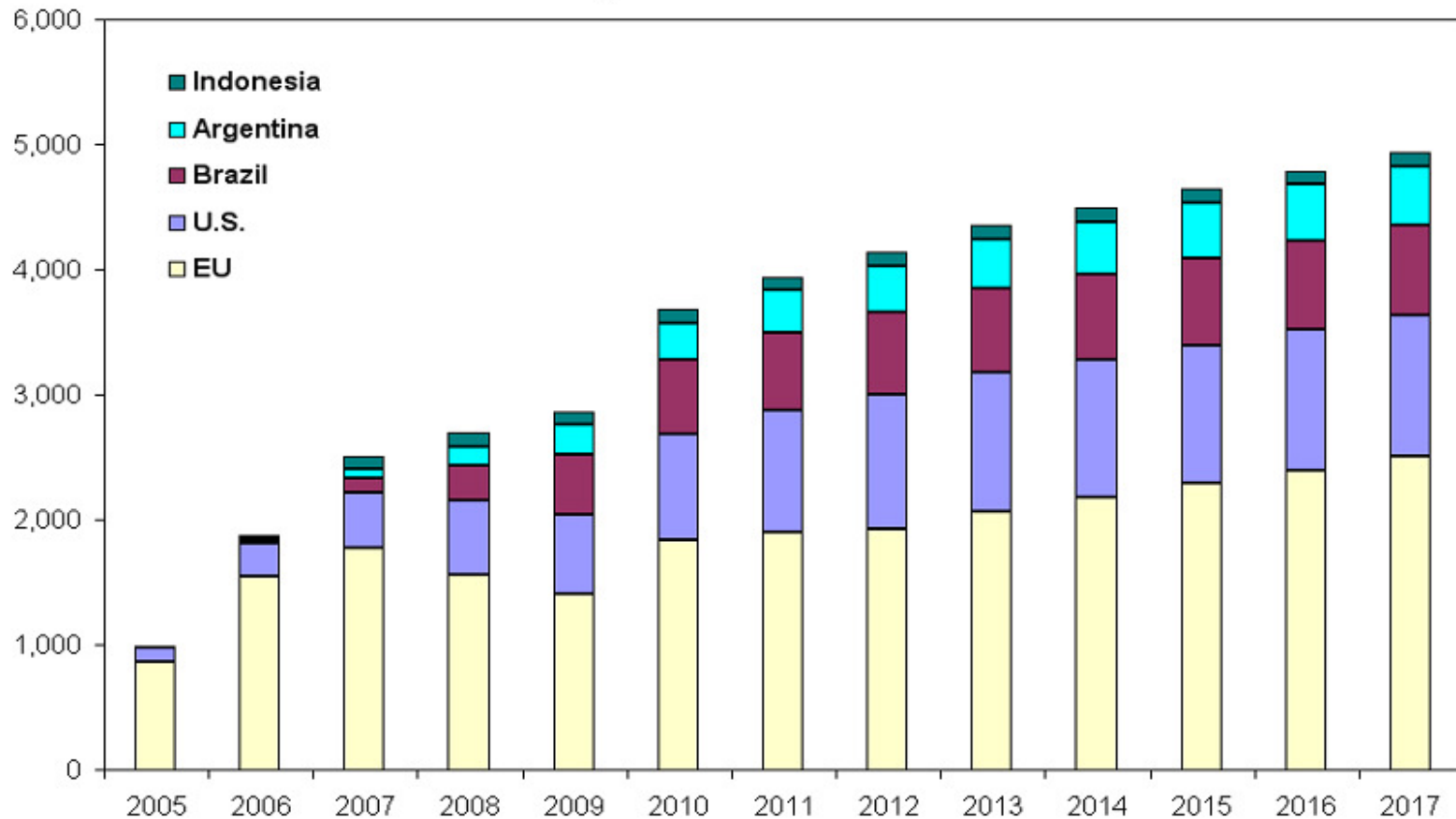


Source: REN21, 2009



World Biodiesel Production

World Biodiesel Production, 2005-2017
Millions of gallons



Source: FAPRI 2008 U.S. and World Agricultural Outlook.



Biodiesel production around the world

- Global biodiesel production: around 13 billion liters per year.
 - European Union: Main producing and consuming market.
- Industrialization process started in the 1990s.
 - Main producers (2008): Germany, the US, France, Argentine and Brazil.



Features of biodiesel use in some countries

Country	Tax Exemption	Type of biodiesel traded	Raw Material	Notes
Germany	Full	Gas stations supply B100 and added diesel oil	Canola	1800 refuelling stations; Biggest producer; Over 2.5 million vehicles approved to run on biodiesel; biodiesel 12% cheaper than diesel.
Italy	Partial (up to 200 thousand ton/year)	B100 for industry and house heating; B5 and B25 for transportation	Canola and sun-flower	17 biodiesel producer
France	Partial (up to 317 thousand ton/year)	Over half of the traded diesel has 5% of biodiesel (Diester). B30 is more used in captive vehicle fleets	Canola and sun-flower	3 biggest biodiesel producers; Of the 13 existing plants 7 blend 5% of biodiesel and diesel oil; 4 thousand vehicles use blend biodiesel more than 5% using B30.
US	Federal incentive *, besides specific tax for each state	B20 (more common), B2 (used by farms and some States rule that all the diesel traded has 2% biodiesel and B100 (little used)	Soy and residual frying oil	Currently used in urban bus fleets; postal services and governmental agencies; 53 biodiesel plants with a capacity for 1,18 million tons per year; Program based on small producers

*Federal law grants a tax credit of US\$ 0,50 / gallon for renewable fuel used in transportation and US\$ 1 for use in agriculture



Biofuel costs compared with prices for oil and oil products (cents per liter)

Oil	Year 2006	
Price U\$/per barrel	50-80	
Price of oil products (before tax)	35-60	
Retail price of oil products	150-200 Europe 80 US	
Biofuel Types	Year 2006 – costs	2030
Sugar cane ethanol	25-50	25-35
Corn ethanol	60-80	35-55
Beetroot ethanol	60-80	40-60
Wheat ethanol	70-95	45-65
Ligno-cellulose ethanol	80-110	25-65
Vegetable oil biodiesel	70-100	40-75
Azote fuel	90-110	70-85



Taking into account

- In 2007 soaring canola and soy bean oil prices led to increased biodiesel costs and damaged producers' profits, since the cost of the feedstock determines the profit (represents 82%). ▶
- Thus, the high price of crude oil fostered biodiesel production. With oil peaking at \$147 per barrel last summer, biodiesel made economic sense. Note that, in general, biodiesel is economically viable only oil barrel price is over 80 dollars.



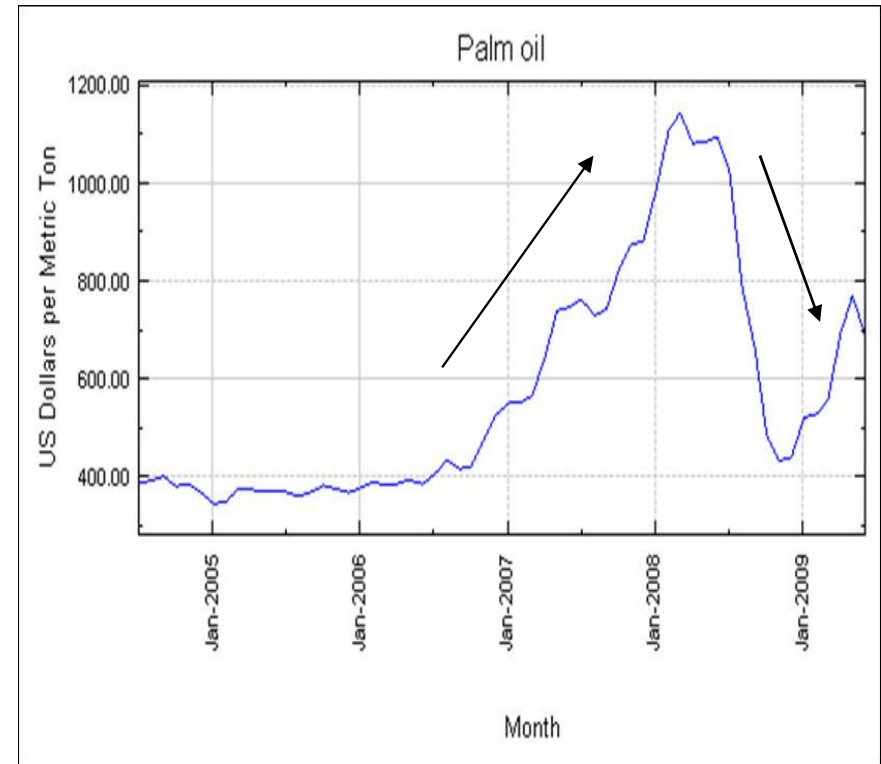
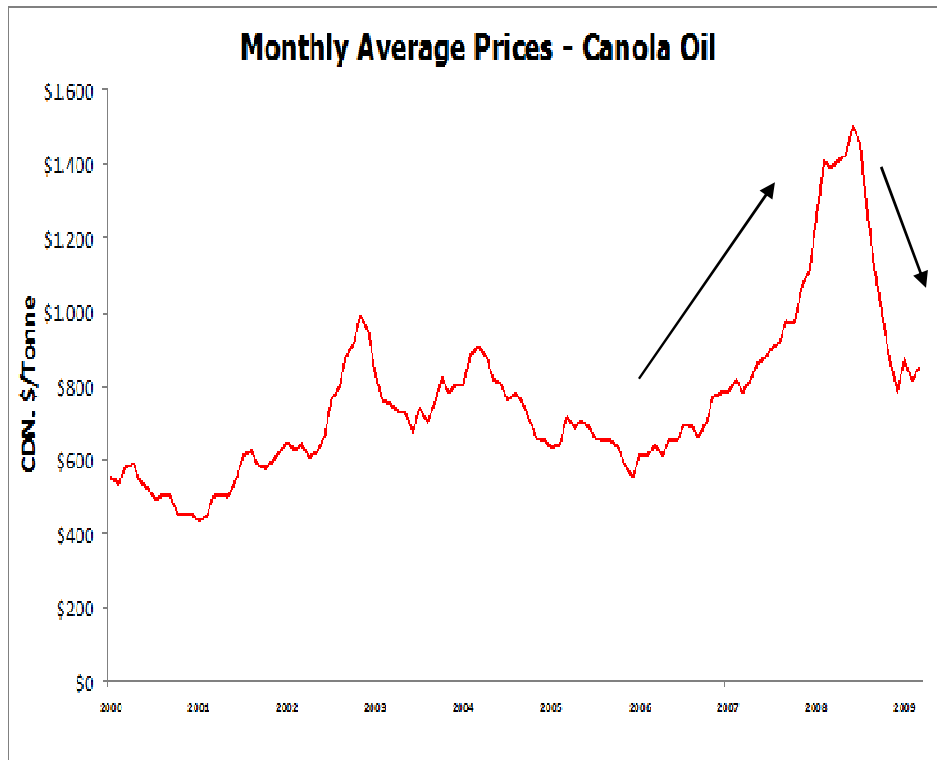
International Soybean Oil Price



Source: Chicago Board of Trade - CBOT



International Canola Palm oil prices



Source: Cereals & Oilseeds Review - Statistics Canada



BIODIESEL IN EUROPE

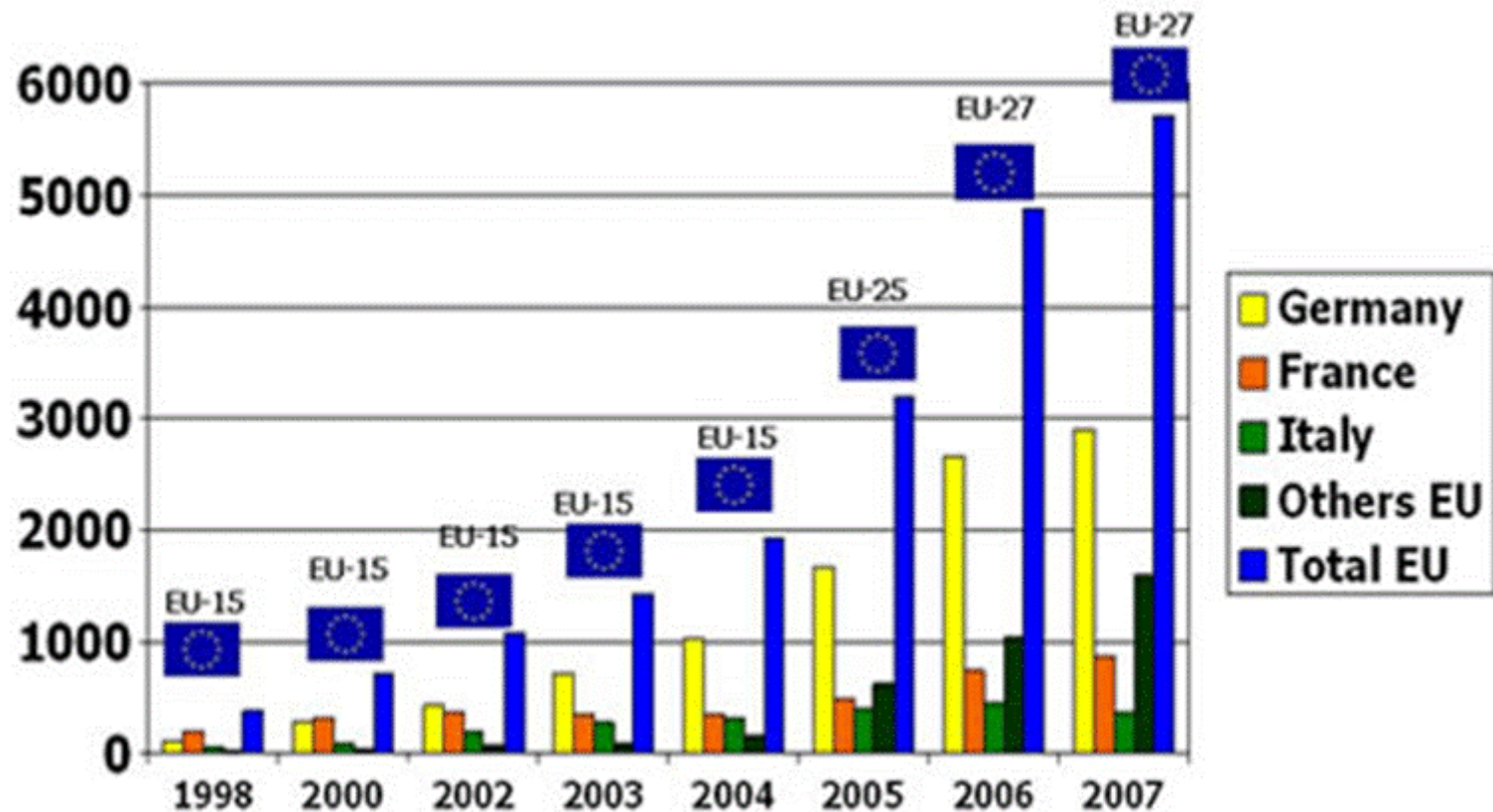


EU's Biodiesel Production

- Targets: Biofuels blended with oil /diesel:
 - 2005: 2%
 - 2010: 5.75%
- Objectives:
 - Fostering sustainable agricultural production
 - Decreasing cost of policies to rural areas
 - Diversifying energy supply
- The number of biodiesel plants foreseen in 2009 is 276
- Tools:
 - Revision of the Common Agricultural Policy (CAP) allowing producers to grow grains not destined to food
 - Energy tax exemption

EU AND MEMBER STATES' BIODIESEL PRODUCTION

EU and Member States' Biodiesel Production ('000 t)




Source: European Biodiesel Board.



BIODIESEL IN THE UNITED STATES

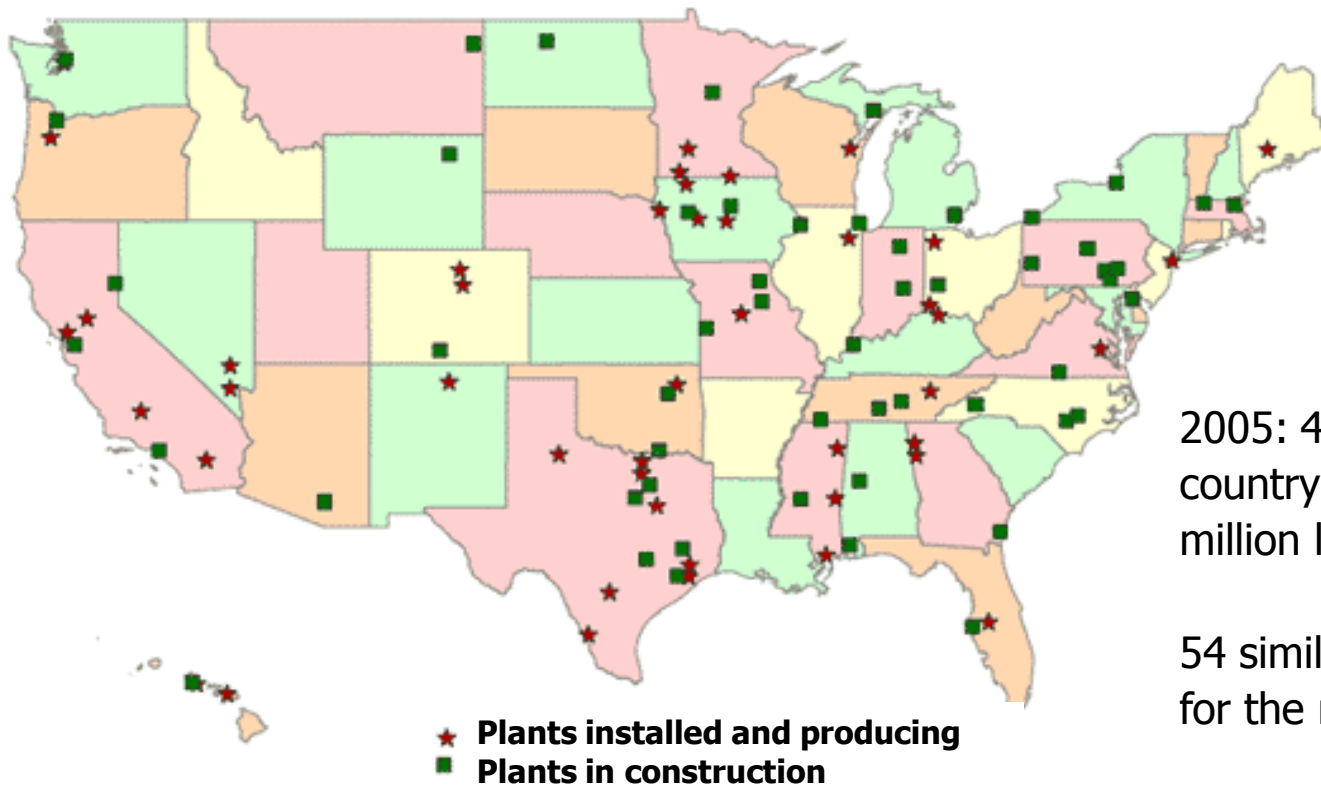


US Biodiesel Production

- Main raw material: **Soybean**, plus frying oil. 
- Production capacity: up 280 million litres / year (National Biodiesel Board, 2006)
- **Objective:** 20% (B20) blend in mineral oil.
- **Incentives:**
 - Tax measures
 - Direct production incentives such as the Commodity Credit Corporation Bioenergy Program (support to raw material acquisition for manufacture),
 - Norms establishing minimum biofuel consumption per public agency and commercial fleets (defined in the Energy Policy Act - EAct).



Installed and in construction capacity in the US September 2005



2005: 45 biodiesel plants in the country producing some 24 million litres / year.

54 similar projects are planned for the near future.

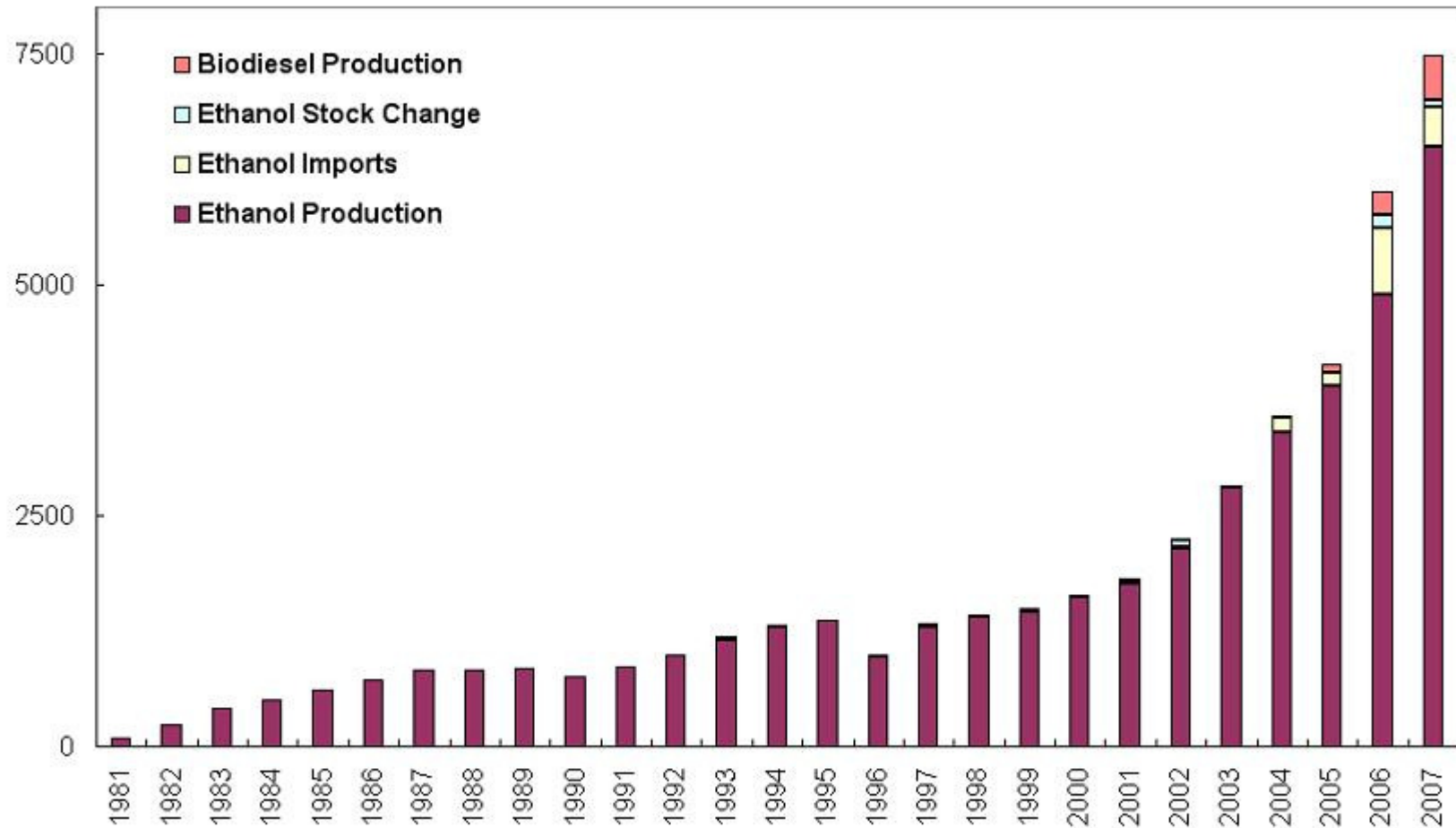
Source: biodieselbr.com



Biofuel Production in the US

Biofuel Production in the United States, 1981-2007

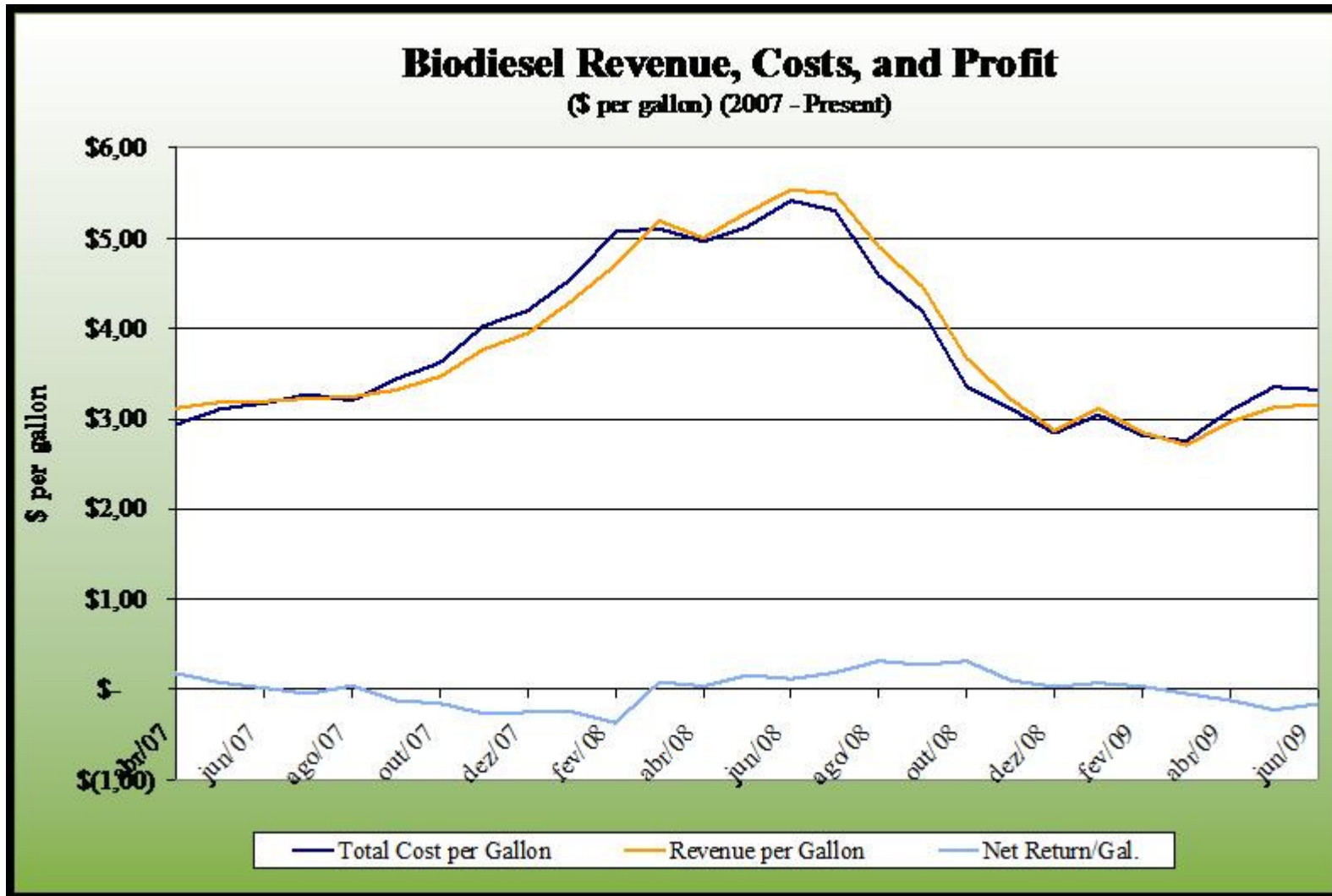
Millions of gallons



Sources: EIA. Annual Energy Review. Table 10.3: Fuel Ethanol and Biodiesel Overview, 1981-2007



US Biodiesel Net Return





US Projected Production Costs for Diesel Fuel by Feedstock, 2004-2013 (2002 Dollars per Gallon)

	Soybean	Yellow Grease	Petroleum
2004/05	2.54	1.41	0.67
2005/06	2.49	1.39	0.78
2006/07	2.47	1.38	0.77
2007/08	2.44	1.37	0.78
2008/09	2.52	1.40	0.75
2009/10	2.57	1.42	0.76
2010/11	2.67	1.47	0.76
2011/12	2.73	1.51	0.76
2012/13	2.80	1.55	0.75

Source: Radich (Energy Information Administration / Biodiesel Performance, Costs, and Use)



US Biodiesel Issues

- Movements against increase in the cost of food.
- Deforestation issues prevented mandatory blends from being implemented.
- Financial Crises: underemployment

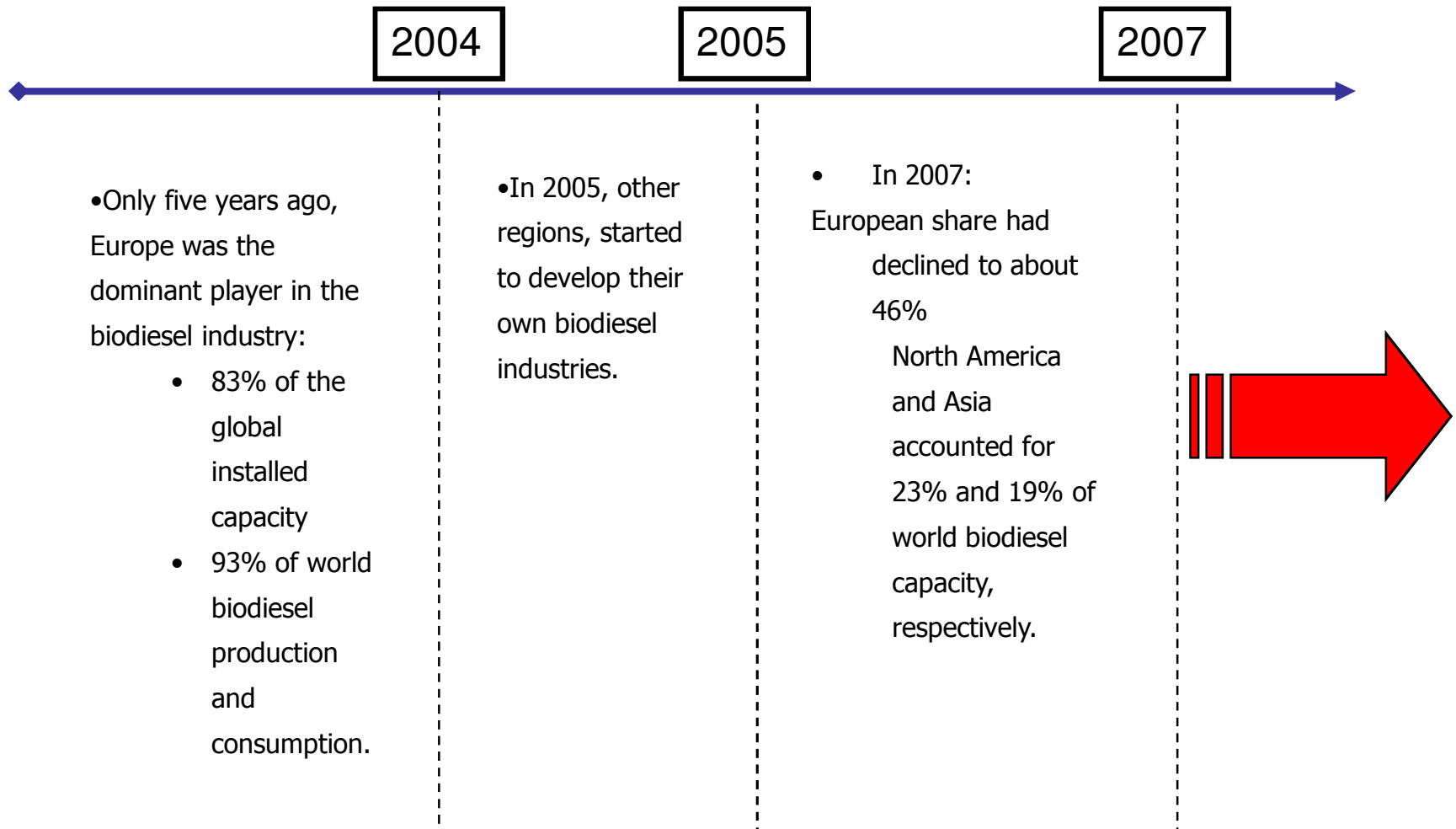


US Biodiesel Issues

- 2008, crude oil price plunged, making the green (biodiesel) option uneconomical.
- Recession: biodiesel firms find it difficult to obtain credit for expansion.
- "The market conditions are very, very tough right now," says Joe Jobe, head of the National Biodiesel Board in Jefferson City, Mo. Of the nation's 176 biodiesel operators, "it's very difficult to say how many of them are still operating." (Forbes.com, 2009)



A shifting scenario

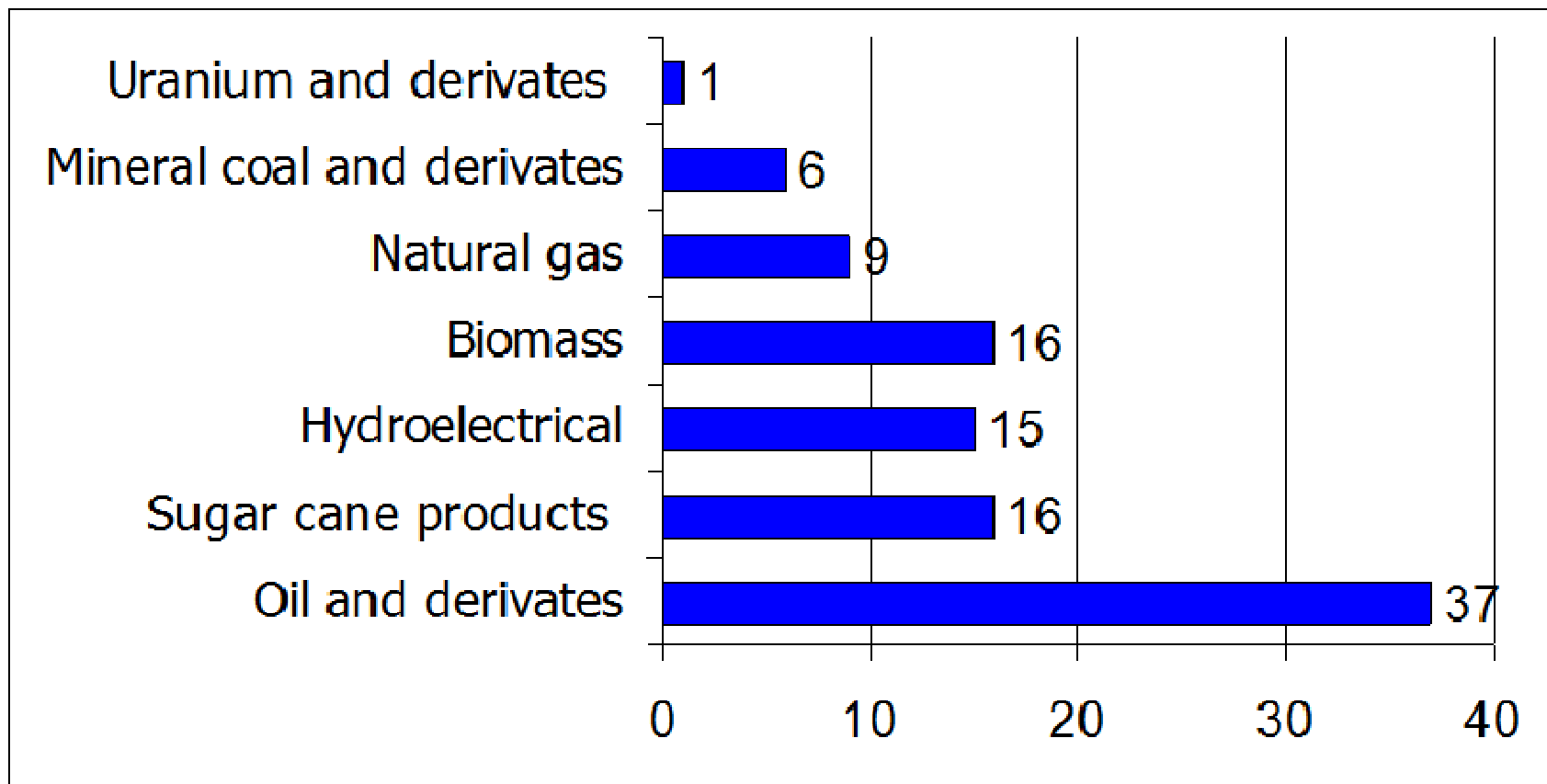




BRAZIL'S BIODIESEL PROGRAM



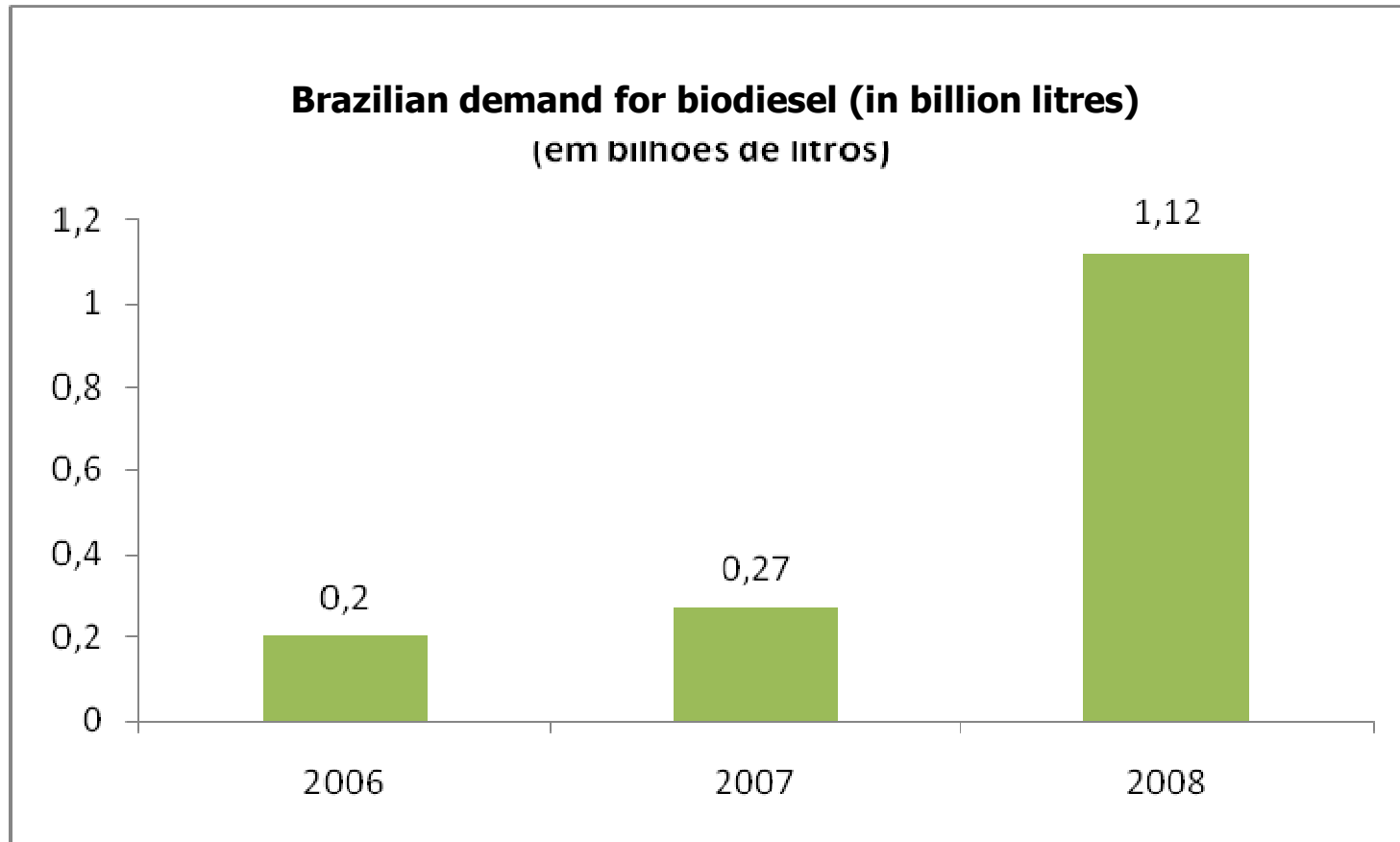
Brazil's Energy Matrix – 2007 %



Source: EBC, 2008



Brazil Biodiesel Demand



Source: ANP, BiodieselBr



Brazil Biodiesel Program

- Ambitious and complex objectives involving three aspects:
 - **Institutional**: to provide market regulation;
 - **Organizational**: to provide incentives to agents of this chain, mainly rural producers;
 - **Technological**: to improve raw material development.



Castor oil



sunflower



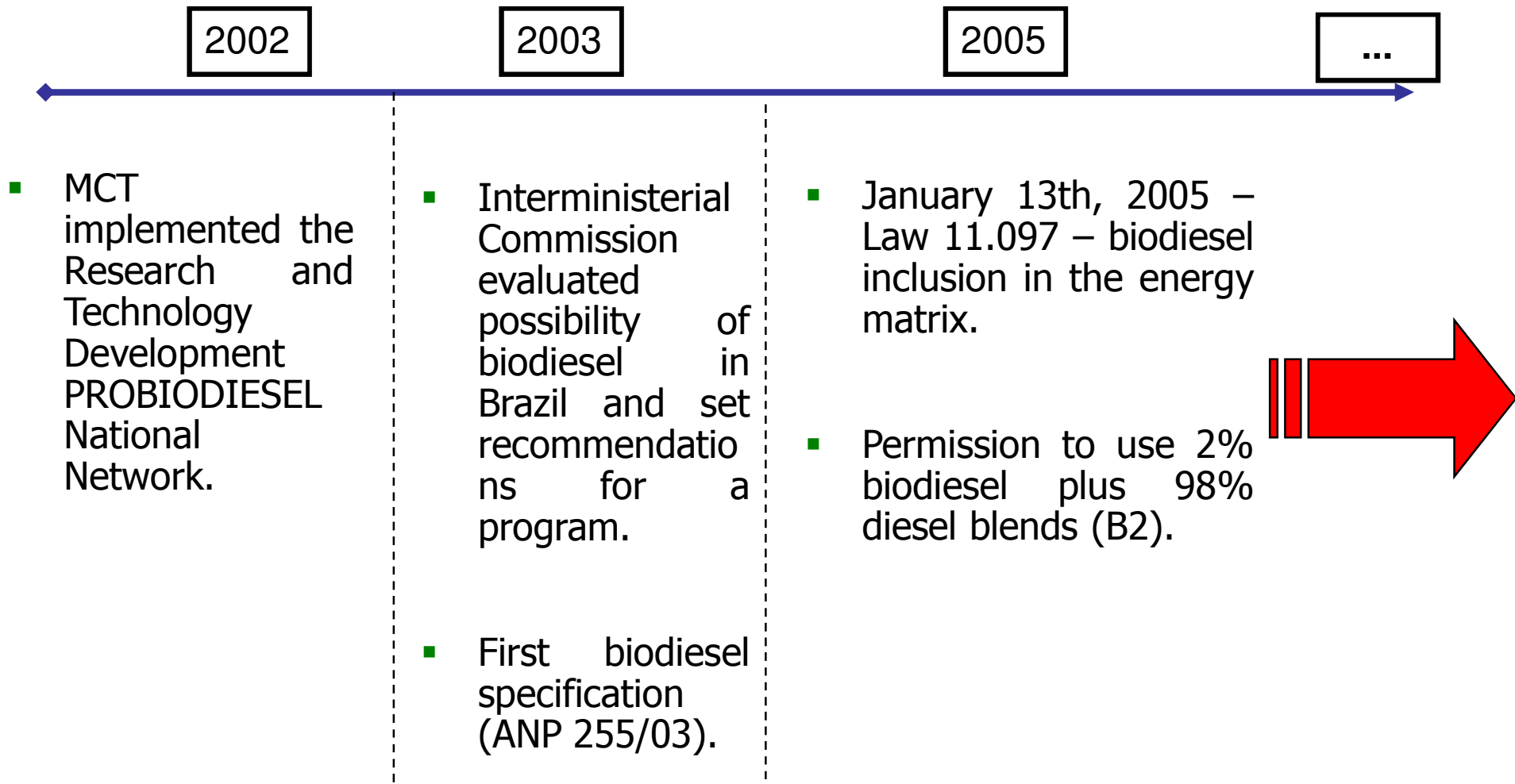
Jathropa



Soybean



Brazil Biodiesel Program





Institutional Aspects

- Brazil's Law No 11.097 of 13 January 2005 introduces a mandatory increase of a minimum percentage of biodiesel to diesel oil traded to consumers, in any part of the country (progressive biodiesel increment reaching B5 in 2013).
- Implementing a **sustainable program** fostering social inclusion;
- Ensuring **competitive prices**, quality and supply;
- Producing biodiesel from **different oleaginous sources** and in different regions.

Key features of the regulatory framework

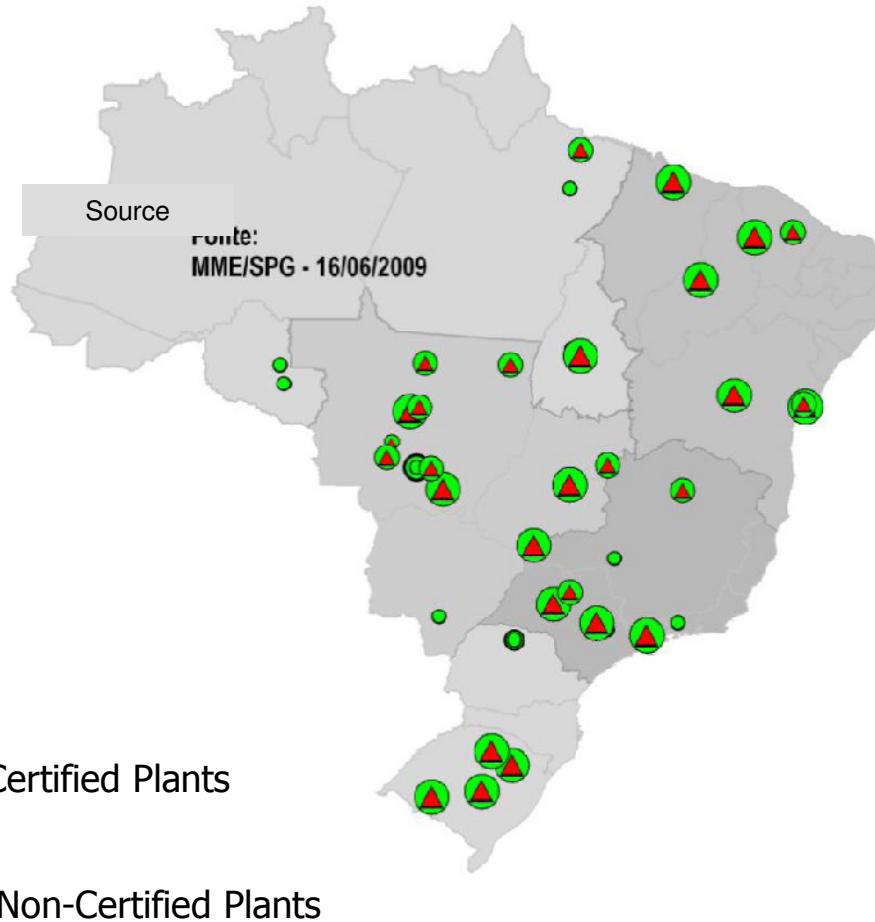
- The biodiesel “Social Fuel Stamp” is a mechanism created by the Brazilian Government to provide incentives for poorer farmers (family farmers) in disadvantaged areas.
- It establishes that biodiesel producers must purchase minimum raw material percentages from family farmers and provide technical assistance. The percentage per Brazilian region is according to the table below:

Region	Minimum percentage of Acquisition from family farms		
	Before	Currently	
N	10%	2009/10 Crop	2010/11Crop
CW		10%	15%
NE	50%	30%	
S	30%		
SE	30%		







Social Fuel Stamp Across Brazil



Region	Number of Plants	Installed Capacity	
		Thousand m ³ /year	%
N	6	185	5
NE	7	698	19
CW	15	1167	32
SE	8	629	18
S	6	917	26
Total	42	3596	100



Key features of the regulatory framework

- Biodiesel producers are granted a reduction on two federal taxes – the social integration program contribution (PIS-PASEP) and the social security contribution (COFINS). 
- Biodiesel producers have access to better financing from the National Bank for Social and Economic Development (BNDES) and other financial institutions.
- The Brazilian biodiesel market is regulated by the Brazilian Government through a public auction system which sets the volume of biodiesel that should be produced.
- The auction system gives preference to producers with the “Social Fuel Stamp”, who are eligible for production of 80 percent of the total auctioned volume. 

Federal tax incentives



North, Northeast and semi-arid regions		
Raw material	PIS/Pasep and Cofins (R\$/lt biodiesel)	
	Without Social Fuel Stamp	With Social Fuel Stamp
CASTOR AND PALM	R\$ 0,15	R\$ 0,00
OTHER RAW MATERIALS	R\$ 0,218	R\$ 0,07

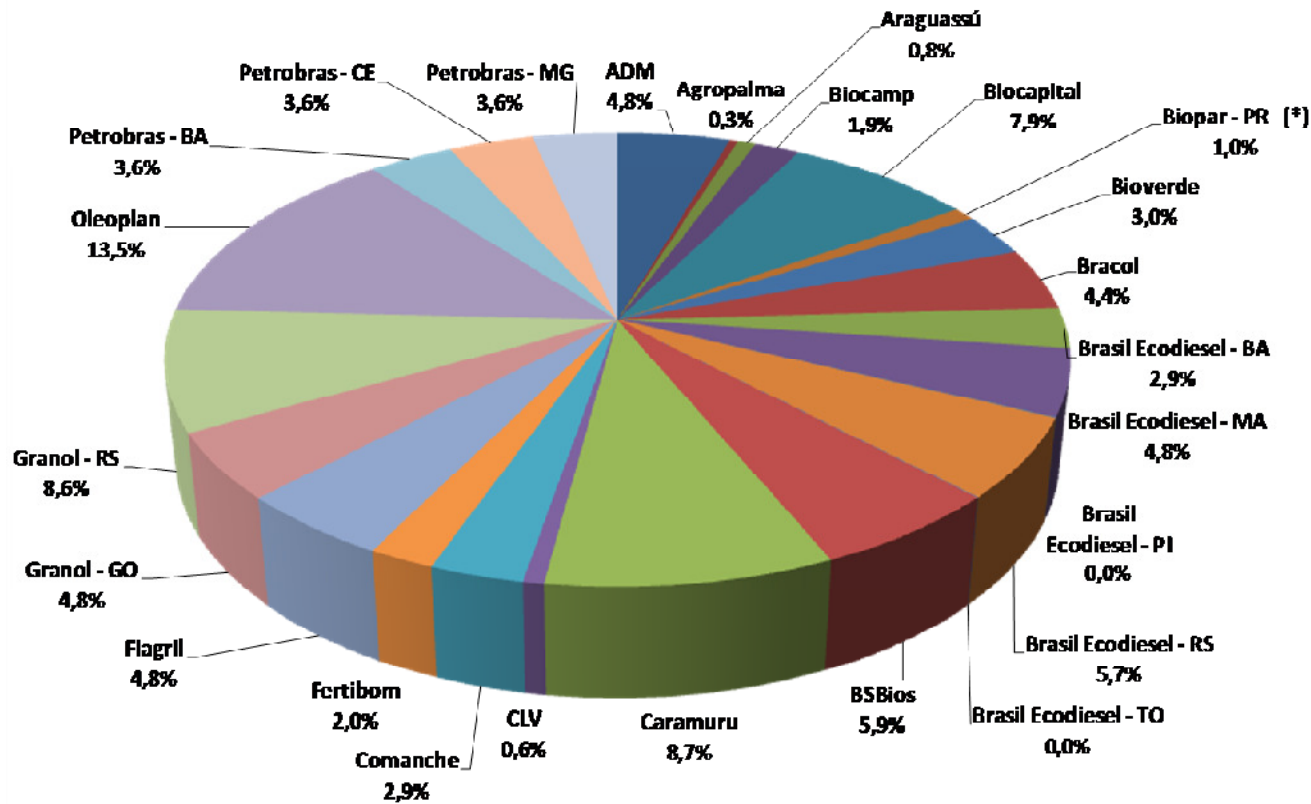
Midwest, Southeast and South regions		
Raw material	PIS/Pasep and Cofins (R\$/lt biodiesel)	
	Without Social Fuel Stamp	With Social Fuel Stamp
ANY RAW MATERIAL	R\$ 0,218	R\$ 0,07

Source: MDA, 2006



13 th SOCIAL FUEL STAMP AUCTION

13 th Biodiesel auction – 315 thousand m³ Plants' share



Supply x Demand (2008) %

Region	Biodiesel Production	Consump B2/B3
CW	45	12
S	27	19
SE	16	44
NE	11	16
N	1	9



Oil crops production in Brazil



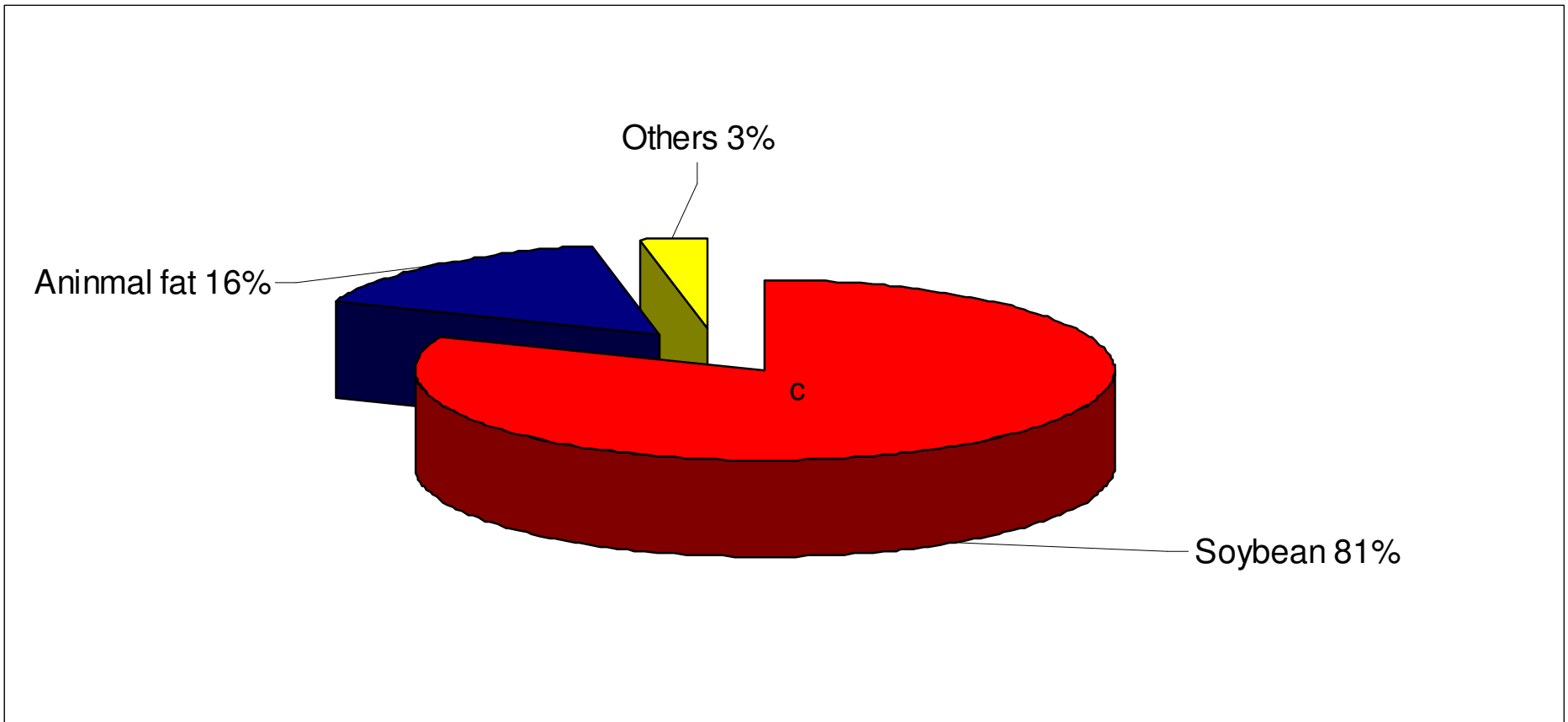


Oil crops production in Brazil





Raw Materials Used for Biodiesel Production in Brazil



Source: ANP (May/2009)



Biodiesel Supply Chain

Rural Producers

Small Producers:
castor, soy

Other producers



Oil
Crusher



Biodiesel
Production



Mixing

Distribution



Petrobras
Contracts



Petrobras
Cooperatives
Private Firms



Petrobras
and
Private Firms



Petrobras



BIODIESEL PROGRAM RESULTS

CASE - SERTÃO CENTRAL

(Ceara State's backlands)



Ceará backlands Production Scenario

Crop	Area (ha)	Production (t)
Castor– Year 2008	40,850	23,999
Castor - Year 2009	13,468	8,080
Sunflower	5,000	2,712
Cotton	2000	1,200
Peanut	300	360
Sesame	250	175
Total	61,868	36,527.67

- Production target- 2009: 33,000 families producing castor crops associated with **bean** and **corn** crops.



Incentive to family agriculture - Ceará backlands

1. Seminar with growers: pre-registration



2. Visits from technicians (Secretariat of Agriculture– Cooptrace e Ematerce – Instituto Agropolos: instructions for planting



3. Reception of seed: castor or sunflower (maximum 5 kg / ha) and corn and bean (GF) and contract signature with Petrobras. Price established by Bahia Stock Exchange.



4. Soil correction : limestone (castor oil) boron (sunflower) and "Tractor Time" (Town hall)



4. Payment of incentive



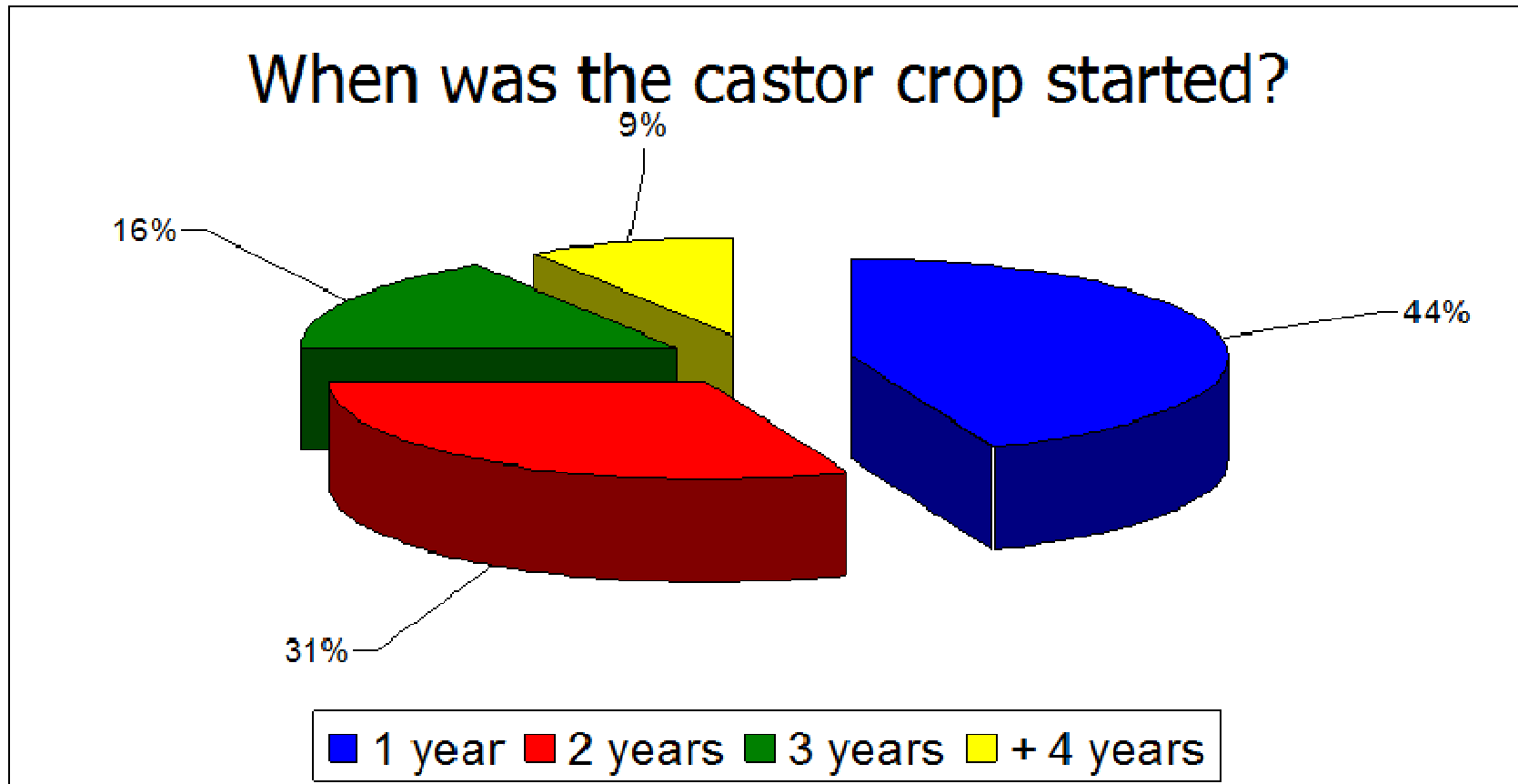
5. Production forecast. Petrobras provides sacs. Purchase of product (hulled or whole)

•5-year contract.

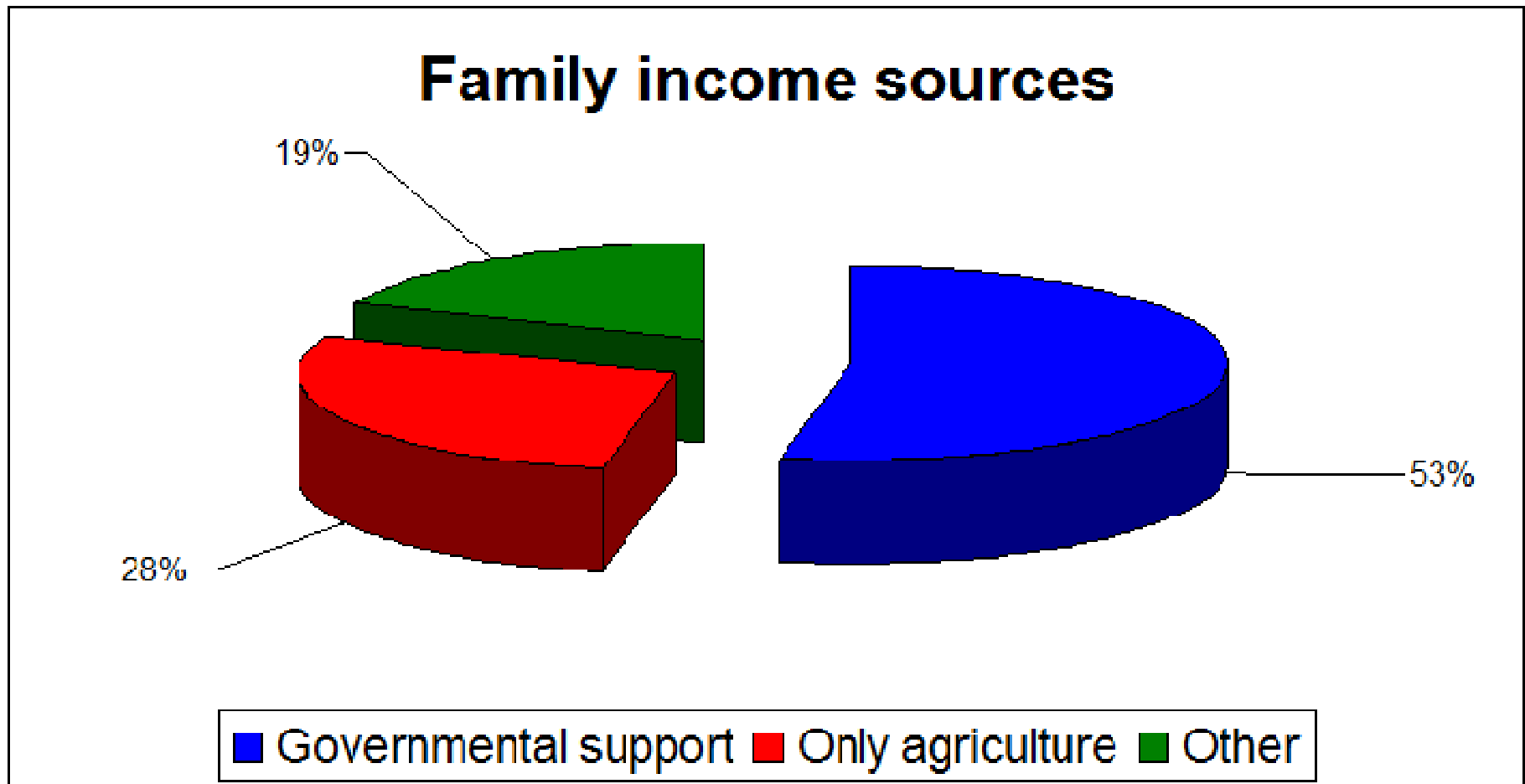
•Farmer: opens account at Brazil Bank.

Castor oil and sunflower seeds	Up to 150
Stand + level planting	Up to 200
Stand + Correction (Limestone + Organic)	Up to 250
Stand + chiseling / decompaction	Up to 250
Stand + stone barrier contours, terraces	Up to 300
Stand +in situ rainwater harvest and direct planting	Up to 300

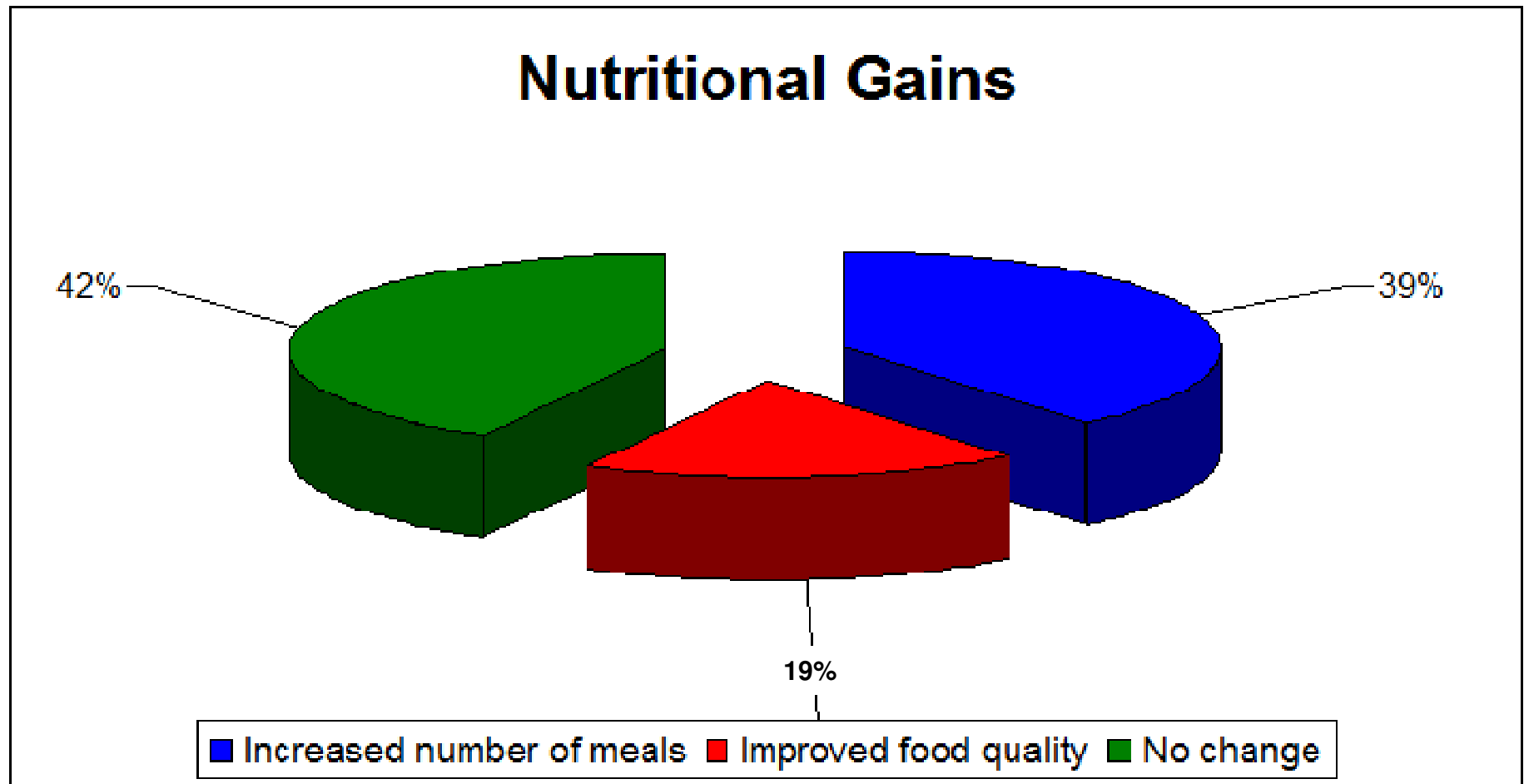
Results from the interviews



Results from the interviews



Results from the interviews





Conclusions

- The current gloomy scenario illustrates the risks of running a business which is plagued by the price volatility of two commodities – in this case, vegetable oils and petrol.
- Nevertheless, there is room in the vast diesel market for several types of fuels to exist side-by-side. In such a setting, biodiesel, renewable diesel and any new biomass-based diesels could only achieve a high penetration rate using all available biomass resources (e.g., soybean oil, other oils and fats, biomass and algae).
- In Brazil, as seen in the case of Ceara's producers, high costs are involved in the Biodiesel Program. The question remains as whether other means should be found to support the family farmers enrolled in Brazil's Biodiesel Program.
- New and large markets for biodiesel are expected to emerge in China and India, since the governments of both countries have announced major biodiesel initiatives.



Issues for debate

- As seen here, Biodiesel Programs are designed to promote social development. Is it viable to create a new market with different and complex social and economic objectives?
- The world grapples with finding new sources of clean fuel. However, the large cities are faced with traffic management problems. Is the real issue at hand developing renewable fuels or new transportation matrix?



Thanks!
