

***GSB/LACAF workshop***

***Future Directions for Global Sustainable Bioenergy***

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***Integrated Analysis  
of biofuels production and use***

***Luiz A Horta Nogueira***

***GSB/LACAF***

***Universidade Federal de Itajubá***

***BRAZIL***

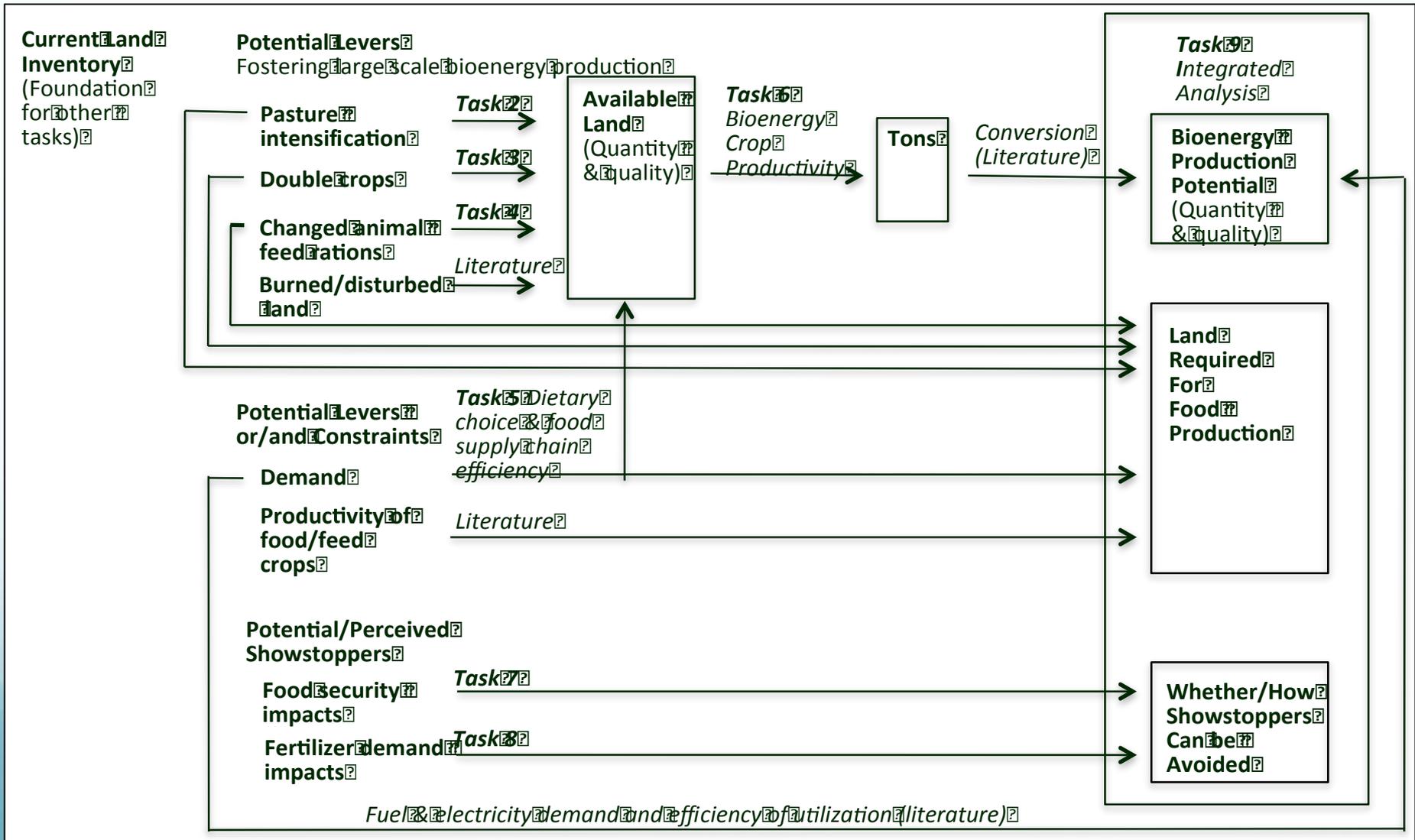
# ***Integrated Analysis of biofuels production and use***

## ***Outline***

- ✓ ***What is integrated analysis?***
- ✓ ***A tentative route***
- ✓ ***Final remarks***
- ✓ ***Additional information***

# What is Integrated Analysis?

## GSB Stage 2 Tasks



# ***What is Integrated Analysis?***

## ***Why Integrated Analysis?***

***Bioenergy systems present relevant synergies and mutual influences.***

***These co-influences exist in many levels, involving the environment, the physical productive system, the society spheres, with positive and negative impacts.***

***Identify, evaluate and understand these relationships are crucial to foster and build sustainable bioenergy systems.***

***Besides “Can we do?” and “Should we do?”, we need to answer “How can we do?”.***

# ***What is Integrated Analysis?***

## ***Objectives of Integrated Analysis***

***The develop a balanced integrated analysis of the several partial assessments (such as physical productive potential, food and energy requirement, production models and innovation) aims to identify hurdles, potential conflicts and synergies in the process of implementing a biofuel agroindustry that are not visible in partial approaches and set some basic guidelines to implement bioenergy programs .***

# ***A tentative route***

## ***Methodology***

***There are few references on this subject and it is not available still a consolidate methodology to apply in this kind of integrated analysis.***

*Halog, A. and Bortsie-Aryee, N.A., The Need for Integrated Life Cycle Sustainability Analysis of Biofuel Supply Chains, in Fang, Z., Biofuels - Economy, Environment and Sustainability, 2013, with interesting insights and approaches on integrated analysis of biofuel programs, such as Multi-criteria Decision Analysis (MCDA) for stakeholders analysis.*

***Some actual experiences of assessing developing countries in Latin America and Africa in the last decades, can be useful.***

# *A tentative route*

## *Planned activities (1/2)*

- **Collect and organize basic data** for Africa and Latin America and the Caribbean countries.
- **For the selected countries, prepare a detailed database**, presenting the evolution, current situation and perspectives of:
  - **Economy:** GNP evolution and composition, agricultural commodities participation and trends in national trade, staple food export and import, financing conditions.
  - **Energy:** national energy matrix evolution and trends, energy prices and costs (mainly for liquid fuels and electricity), vehicular fuels demand and market structure, light vehicles fleet (number and age), energy dependence situation and concerns, regulatory framework and decision making processes.
  - **Agriculture and agro-industry** (with emphasis in sugarcane and sugarcane products): planted area, production, domestic demand, prices and estimated costs of main agricultural products, arable land, irrigation requirements, agricultural inputs market, institutional aspects, research activities and resources, management and financing issues.
  - **Environmental issues:** general appraisal of near-term potential and perspectives of increase bioenergy production, legislation (including fuel specs and emission limits), institutions and decision making processes.
  - **Social aspects:** employment and wages indicators (rural and urban), HDI evolution and trends, public perception on biofuels programs.
  - **Know-how in renewable energy, bioenergy and biofuels:** outputs and lessons from previous experiences, projects and programs, human resources (technical and university levels), equipment industry situation and perspectives.

# ***A tentative route***

## ***Planned activities (2/2)***

- **Define a preliminary potential of ethanol production**, taking into account the data obtained in the previous phase and considering two basic scenarios: a) to keep the current status of sugarcane agroindustry and use the available molasses and a marginal increment in sugarcane productivity and b) to expand the sugarcane production, under the constraints evaluated before.
- **Forecast the domestic ethanol demand**, considering the fleet actual composition and evolution, and two basic scenarios: a) an E10 blending program and b) a pure hydrous ethanol flex fuel vehicle introduction.
- **Evaluate the perspective of an national ethanol program introduction**, based on the preceding phases and taking into account also the institutional perspective and other constraints and drives.
- **Develop a preliminary assessment of the benefits and impacts of ethanol production and use**, in energy, social, economic and environmental terms.
- **Prepare an initial list of topics to be dealt aiming to improve the bases for an ethanol program planning and implementation.**

# *Final remarks*

- ✓ In simple words, the objective of Integrated Analysis is to support sound and effective decisions. Anyway, the decision making process is not necessarily rational.
- ✓ Our proposal is to merge the several partial analysis and introduce, as much as possible, institutional factors in the usual “aseptic” scientific assessment.
- ✓ Among the challenges to face, we can highlight:
  - How to take into account the time dimension (before and after)?
  - How to consider the biofuel trading?
  - The local perspective is essential.

## ***Additional information***

- ✓ ***Relevance of regulation in biofuels market***
- ✓ ***The current context of ethanol program in Brazil***
- ✓ ***Aviation biofuels project***
- ✓ ***Interesting references***

# ***Relevance of regulation in biofuels market***

***To foster biofuels production and use, just market forces will be not enough.***

***It is necessary also:***

- to inform consumers***
- to reduce risk perception of investors***
- to guarantee benefits for the society and environment.***

***More than this, it is necessary to conciliate interests, generally powerful in the energy scenario and obtain political support among stakeholders.***

***The actual experience with biofuels introduction in several countries confirm the **importance of public perception and a careful planning of the program**, frequently involving oil companies, which generally are the owners of logistic chain of oil products.***

# ***Relevance of regulation in biofuels market***

***To create effective and sound conditions for biofuels market development, besides creating proper conditions for investments in biofuels production, some measures can be advised:***

- 1. Biofuel quality specifications should be established***
- 2. An equilibrated tax regime should be implemented***
- 3. A blending program should be implemented***
- 4. A R&D program must be promoted***

# ***Proper biofuels specs are essential***

***Any fuel specification should harmonize basically different perspectives:***

***Consumers***

***Environment***

***Fuel producers***

***It is generally a government role to define fuel specification, by its regulatory agencies.***

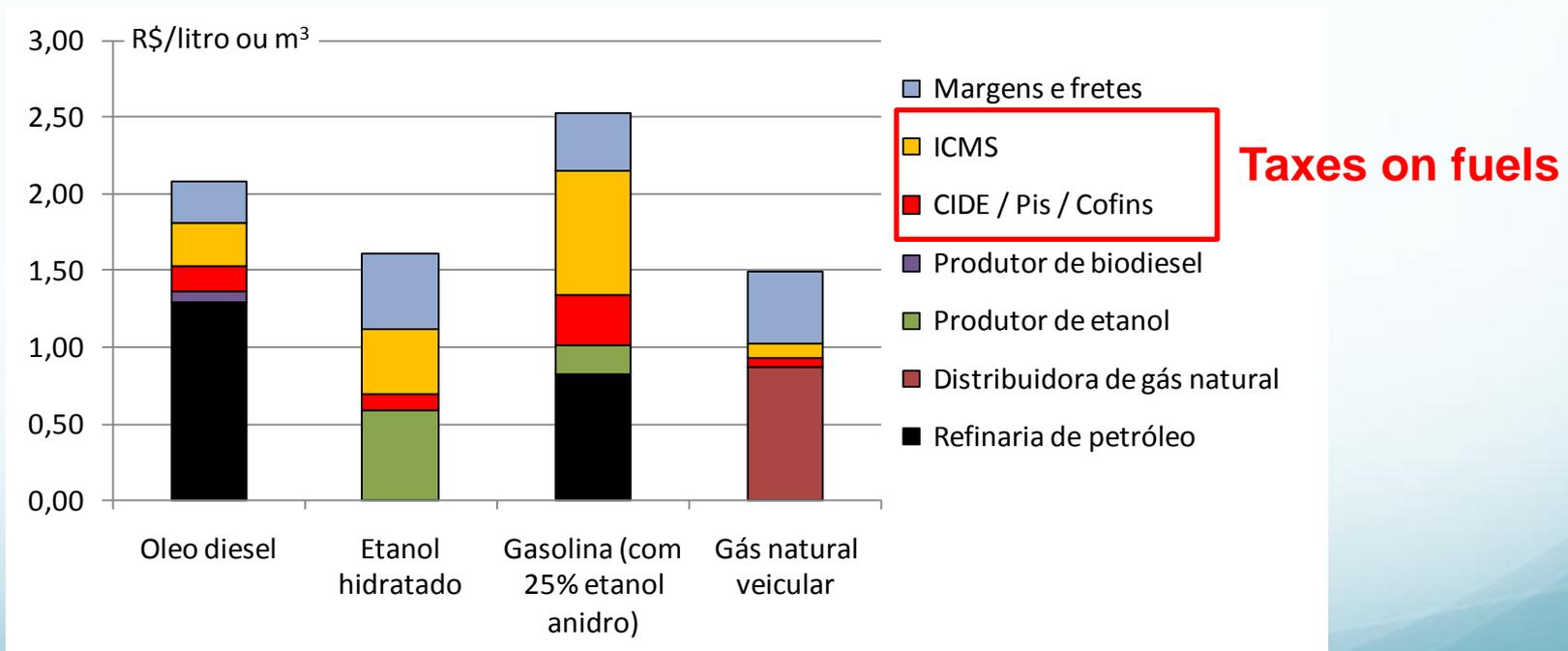
***Beyond set fuel specifications, to evaluate systematically the product in market and enforce properly any distortion are also relevant governmental responsibility.***

# The tax regime makes difference

*In order to balance final costs in the fuel market and introduce the externalities costs and benefits, an equilibrated tax regime should be implemented.*

*In the Brazilian context the fiscal target is to offer to consumers final costs approx. similar using either ethanol, or gasoline.*

*Fair prices are crucial for biofuel promotion.*



**Fuel prices breakdown in Rio de Janeiro, May 2009**

# ***The ethanol conundrum in Brazil***

***Alleging inflation control, the Brazilian government (which holds the control of Petrobras, the main oil products supplier) has kept the gasoline price (at the refinery gate) at approximately 70 US\$/barrel for the last 5 years, while the international price of gasoline was above 120 US\$/barrel .***

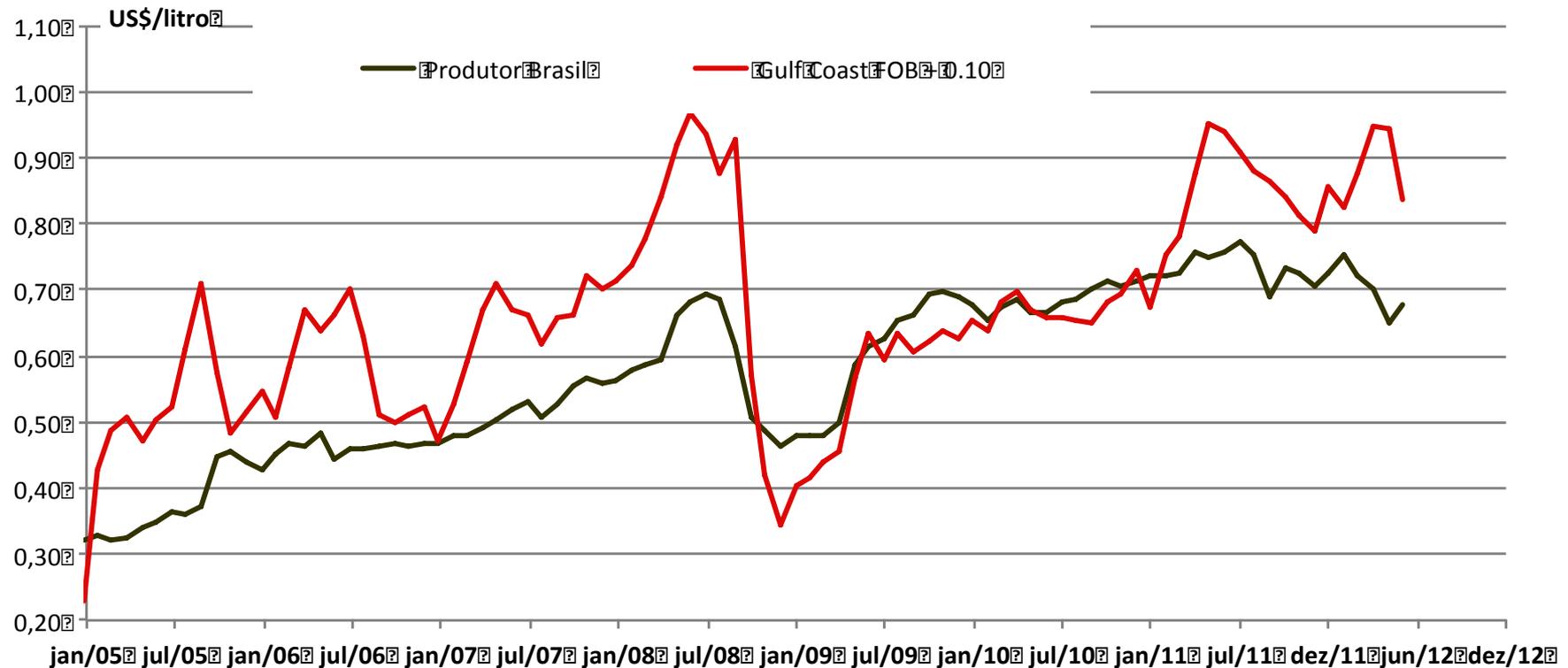
***More recently some price adjustment have been done, but a relevant lag remains, with regards the international parity price, imposing losses to Petrobras. Those price corrections were compensate by federal tax reduction, in order to keep the price at gas stations stable.***

***In this period, the ethanol production cost increased (introduction of mechanical harvesting, increase of wages and inputs, etc.), reducing the ethanol competitiveness and moving the fleet (predominantly flex-fuel) to consume gasoline.***

***Thus, due to this intervention in gasoline prices and gasoline tax reduction, **ethanol has been substituted by gasoline**, and ethanol production in 2010 was 30% less than in 2008.***

# The ethanol conundrum in Brazil

## Prices of regular gasoline, at producer gate, ex-taxes

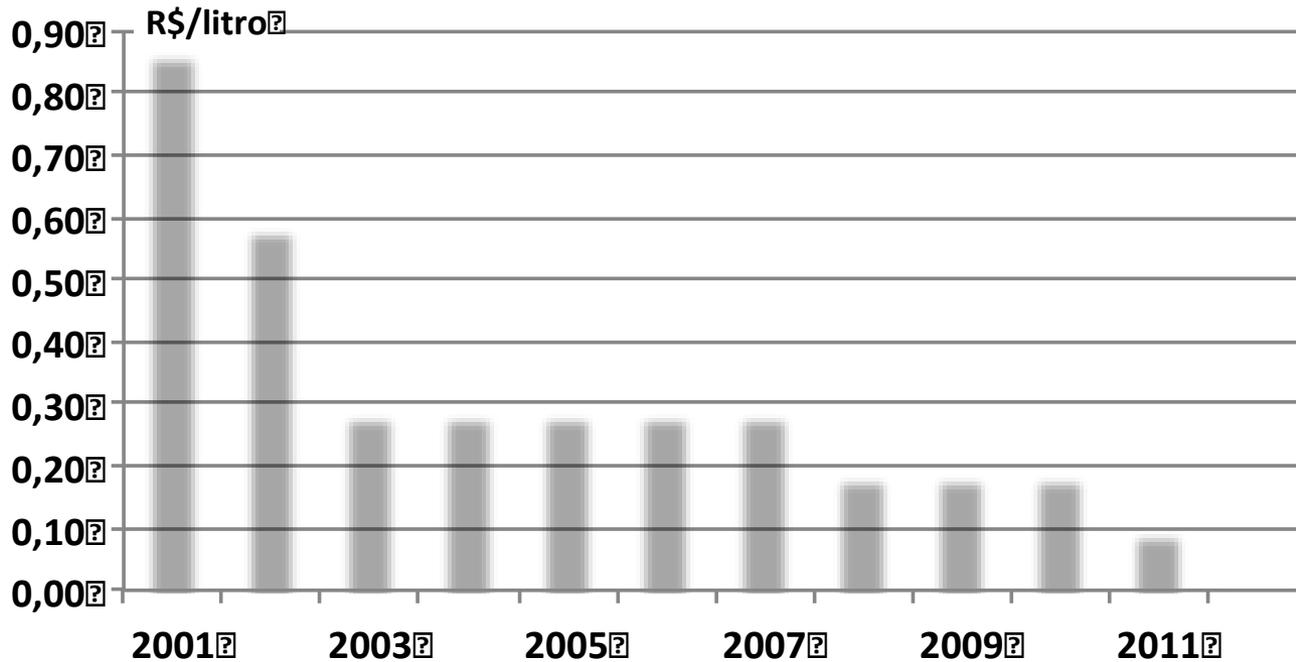


(ANP, 2012; IPEADATA, 2012; IEA, 2012)

**Issues on price parity: definition, exchange rate influence, FOB/CIF conditions.**

# *The ethanol conundrum in Brazil*

## CIDE (main federal tax) on gasoline in Brazil

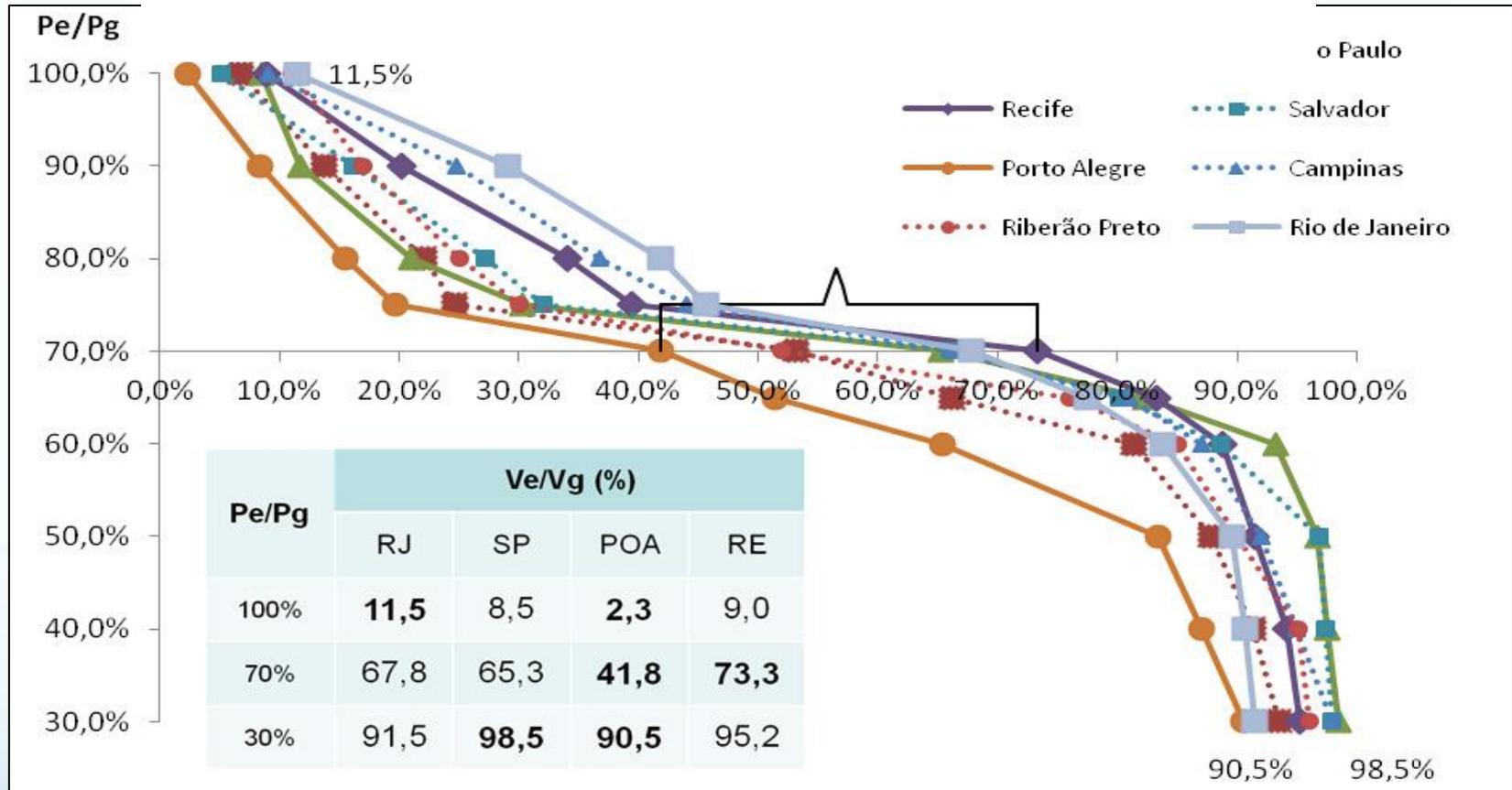


(MINFAZ, 2012)

***The CIDE reduction means an annual subsidy of US\$ 2.2 billion to gasoline consumers.***

# The ethanol conundrum in Brazil

## FFV's owners behaviour in relation to fuel price

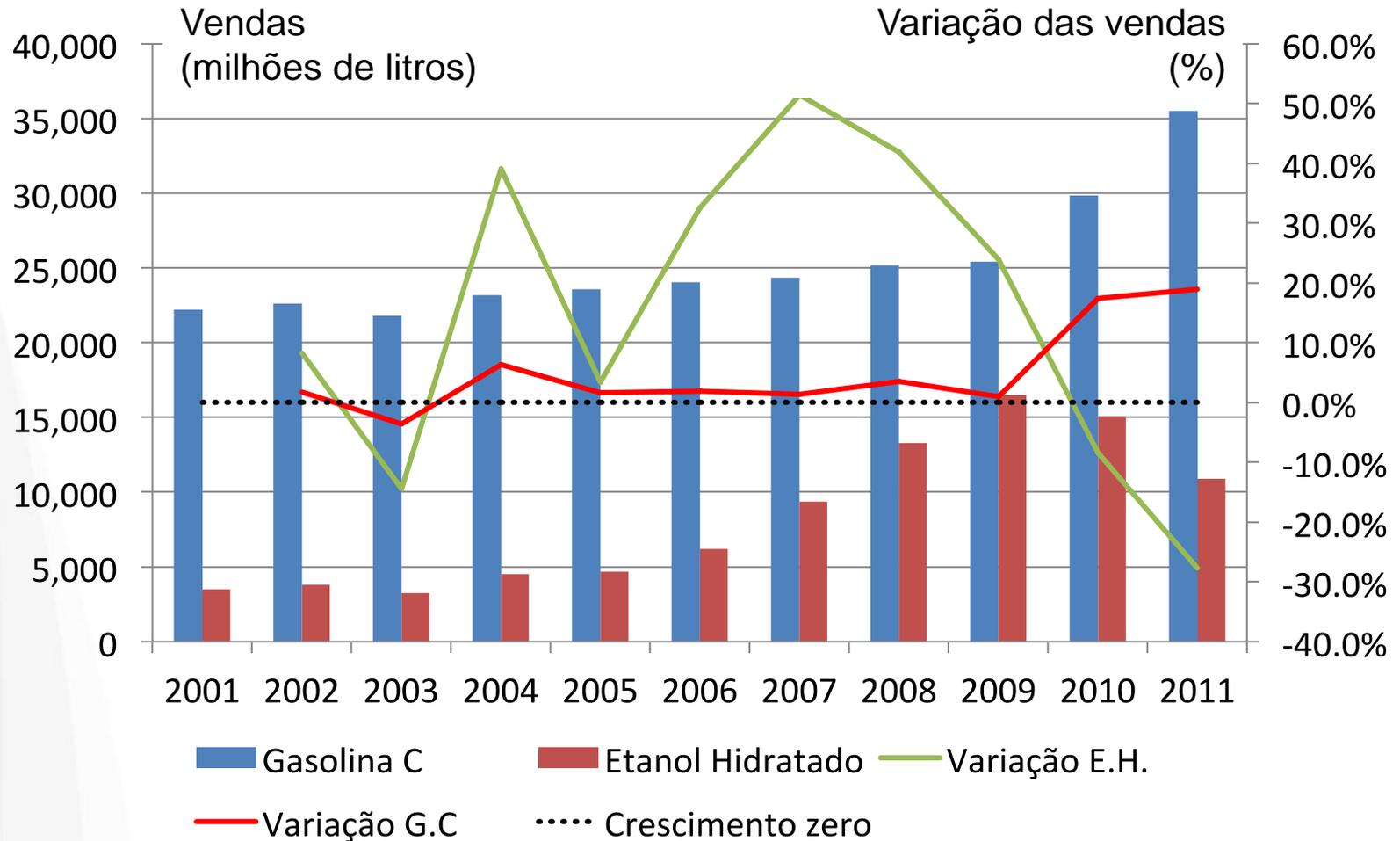


(EPE, 2013)

**A Brazilian fleet of light vehicles, largely FFV's, reacts very quickly to changes in the relative price of fuels, rationally looking for the cheapest one.**

# The ethanol conundrum in Brazil

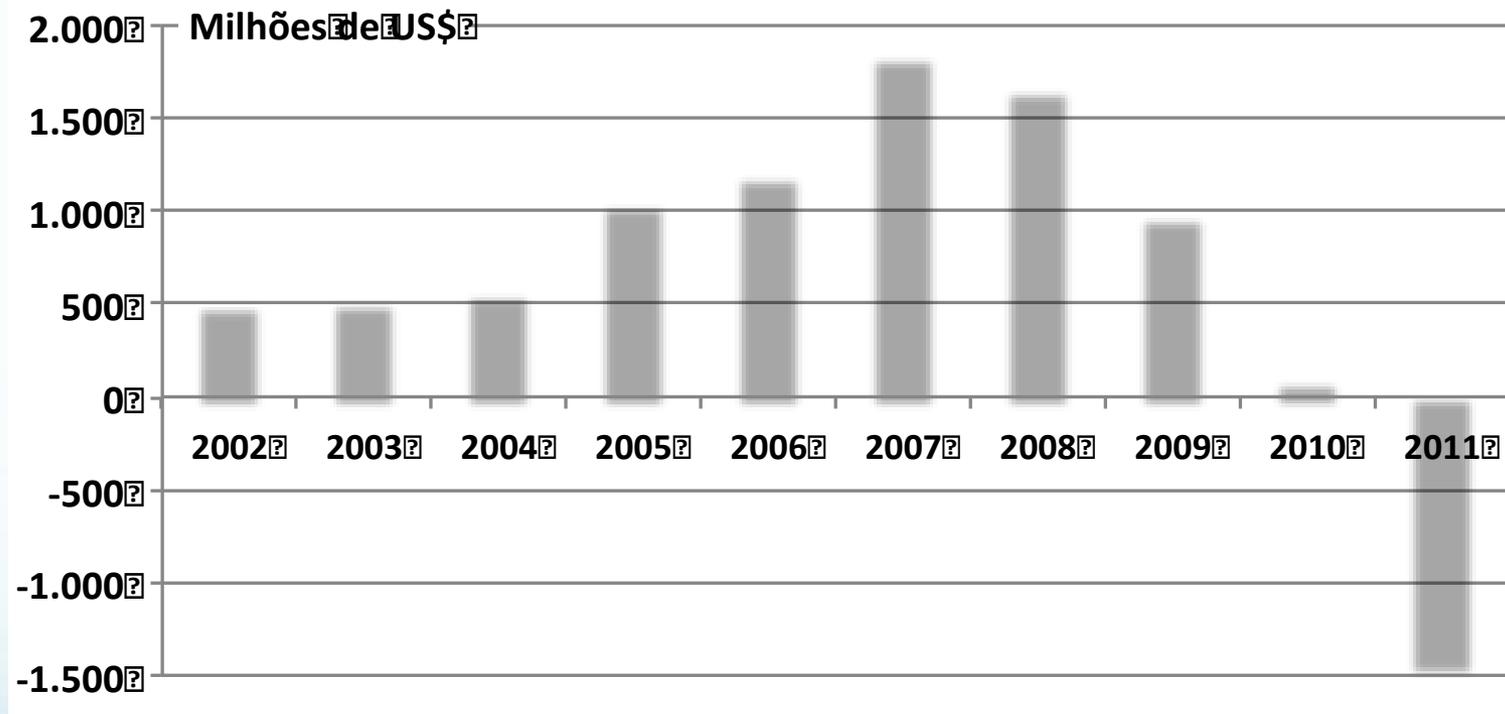
## Sales of fuel for light vehicles in Brazil



(ANP, 2012, edited by: Neves, M.F./ Markestrat)

# The ethanol conundrum in Brazil

## Net outcome of gasoline trade in Brazil

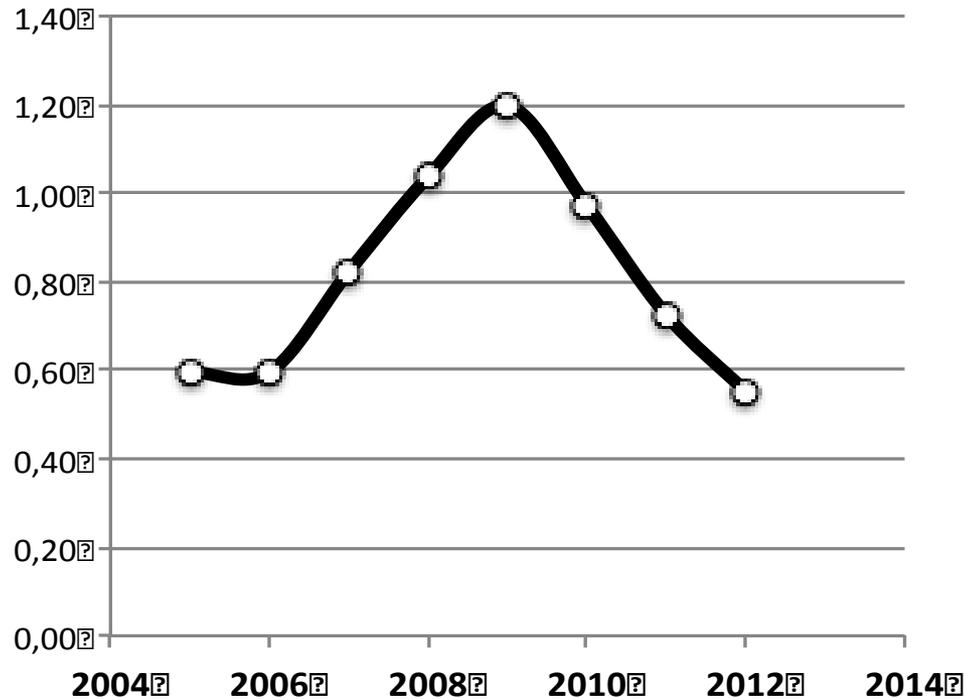


(ANP, 2012)

***Brazil started to import gasoline, after many decades of self-sufficiency.***

# *The ethanol conundrum in Brazil*

**Ethanol sales (anhydrous and hydrous)**  
**Gasoline sales**



(ANP, 2012)

***There are some signals that the Brazilian government will correct these distortions, but up to now it was "just for show".***

## **Flightpath to Aviation Biofuels in Brazil ISAF 2013 – Stellenbosch, SA**

***This project was launched and supported by FAPESP, BOEING and EMBRAER and led by UNICAMP, involving several stakeholders to assess the technological, economic and sustainability challenges and opportunities associated with the development of a sustainable jet biofuel for aviation in Brazil.***

### ***Workshops on Sustainable Aviation Biofuels***

## **FLIGHTPATH TO AVIATION BIOFUELS IN BRAZIL: ACTION PLAN**

<b>Workshop</b>	<b>Venue</b>	<b>Date</b>
1–Project Overview	FAPESP, São Paulo, SP	April 25-26, 2012
2–Feedstocks	ESALQ/USP, Piracicaba, SP	May 22-23, 2012
3–Refining Technologies	FEQ/UNICAMP, Campinas, SP	July 11-12, 2012
4–Sustainability	FIEMG, Belo Horizonte, MG	August 22-23, 2012
5–Policy and Incentives	Embrapa Agroenergia, Brasília, DF	September 11-13, 2012
6–Logistics & Support	ANP, Rio de Janeiro, RJ	October 17-18, 2012
7–R&D and Commercialization Gaps	CTA, São José dos Campos, SP	November 28-29, 2012
8–Briefing to Stakeholders	FAPESP, São Paulo, SP	December 12, 2012

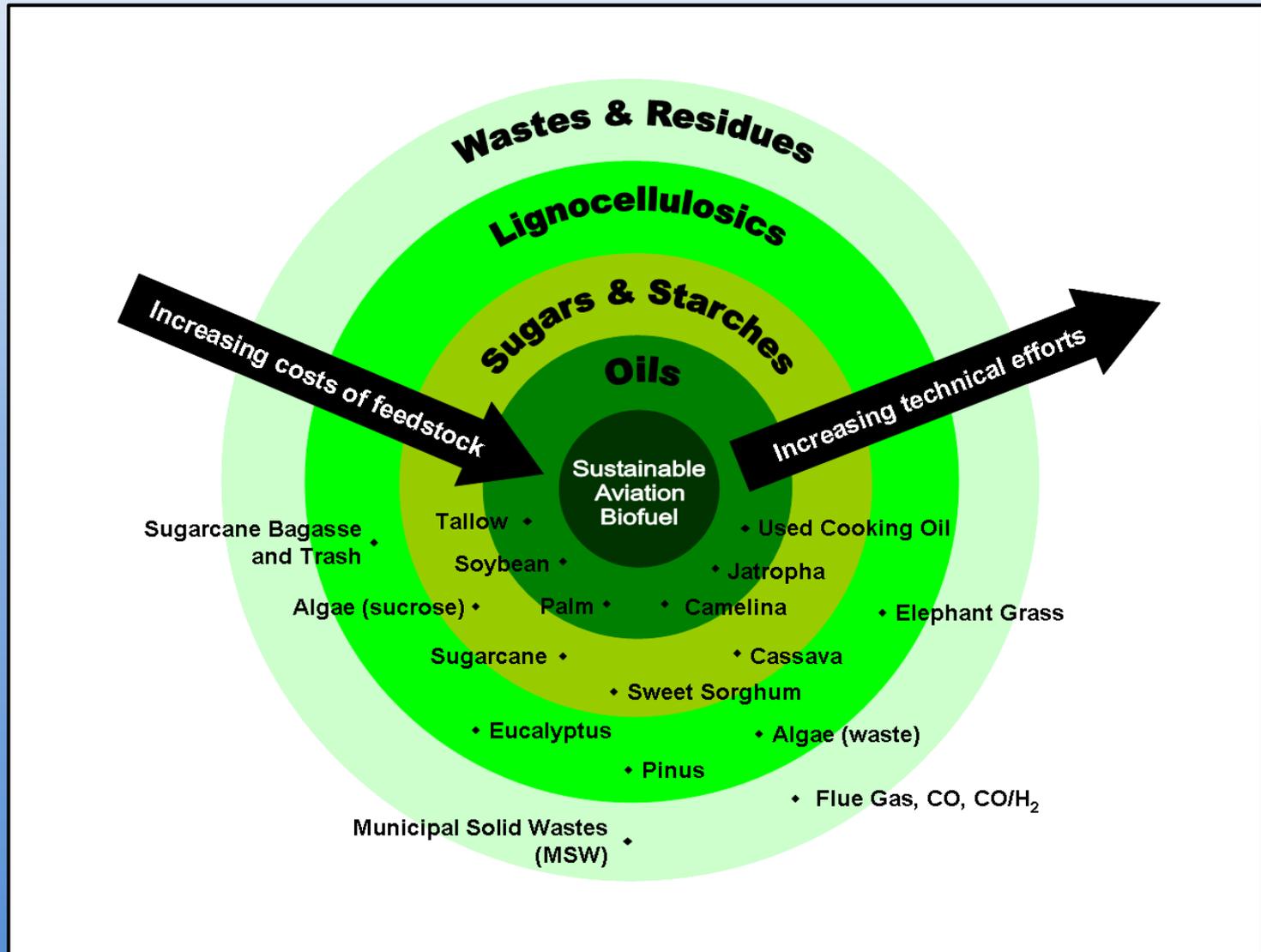
 **BOEING**

 **EMBRAER**

 **FAPESP**

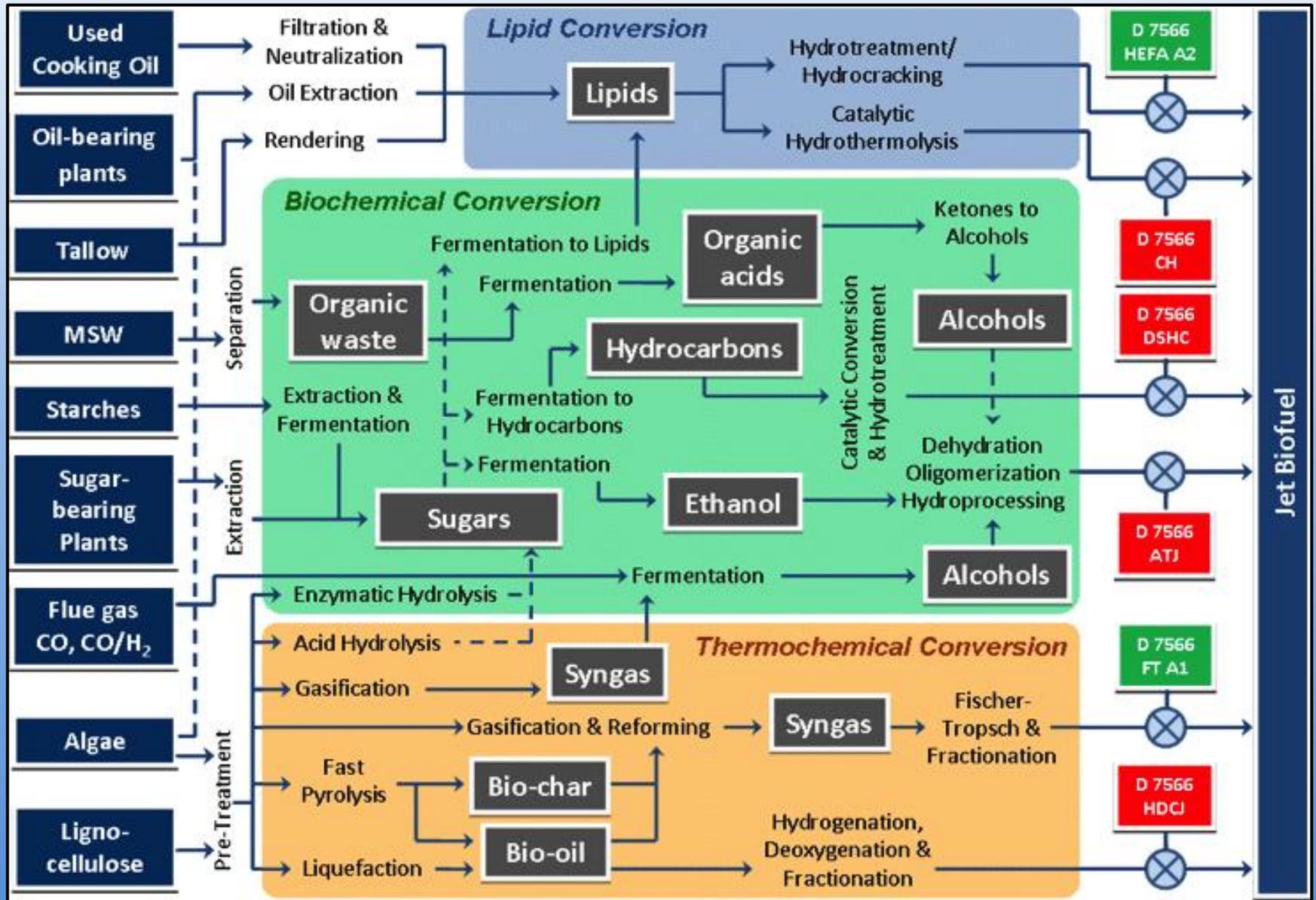


# 25 feedstock were evaluated: the challenging trade-off



# Several production pathways have been assessed

Flightpath to Aviation Biofuels in Brazil  
ISAF 2013 – Stellenbosch, SA



The Lancet, [Volume 378, Issue 9793, Pages 804 - 814, 27 August 2011](#)

# **The global obesity pandemic: shaped by global drivers and local environments**

Prof. Boyd A Swinburn MD a , Gary Sacks PhD a, Kevin D Hall PhD c, Prof Klim McPherson PhD d, Prof Diane T Finegood PhD e, Marjory L Moodie DrPH b, Prof Steven L Gortmaker PhD.

## **Summary**

The simultaneous increases in obesity in almost all countries seem to be driven mainly by changes in the global food system, which is producing more processed, affordable, and effectively marketed food than ever before. This passive overconsumption of energy leading to obesity is a predictable outcome of market economies predicated on consumption-based growth. The global food system drivers interact with local environmental factors to create a wide variation in obesity prevalence between populations...

# Plant Breeding and Biotechnology

Societal Context and the  
Future of Agriculture

DENIS MURPHY



## **Plant Breeding and Biotechnology**

Societal Context and the Future of Agriculture  
Denis Murphy, University of Glamorgan  
ISBN:9780521823890  
Cambridge University Press, September 2007

From **World Agriculture: Towards 2015-2030**, FAO, 2004

... growth in food production will be higher than population growth. By the year 2015/2030 per capita food supplies will have increased and the incidence of undernourishment will have been further reduced in most developing regions ... The world population will be increasingly well-fed by 2030, with 3050 kilocalories (kcal) available per person, compared to 2360 kcal per person per day in the mid-1960s and 2800 kcal today. This change reflects ... the rising consumption in many developing countries whose average will be close to 3000 kcal in 2030.<sup>652</sup>

***Thanks for your attention.***



***L. A. Horta Nogueira***  
***horta@unifei.edu.br***  
***EXCEN/UNIFEI***

**EXCEN Excellence Centre on Energy Efficiency**