

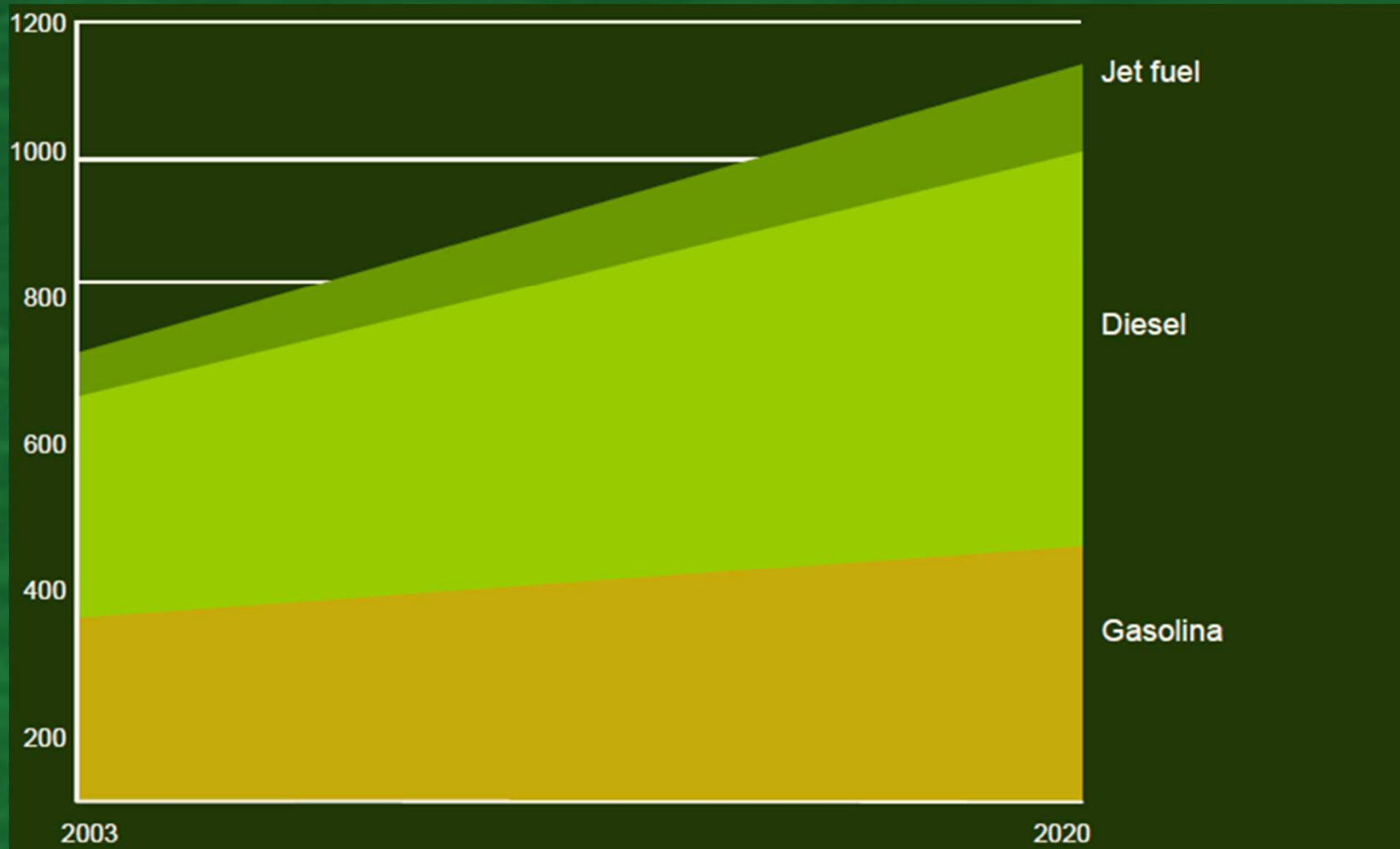
# **Biodiesel, Biofuel for Aviation and Sustainability**

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# World Fuel Market

(Billion gal/year)



# Brazilian Biodiesel Program

B2 mandatory at Jan/2008 (850,000 ton/year)

B3 mandatory at Jul/2008 (1,300,000 ton/year)

B4 mandatory at Jul/2009 (1,800,00 ton/year)

B5 mandatory at Jan/2010 (2013, originaly)

67 biodiesel plants (> 6,000,000 ton/year, capacity)

36,000 gas stations providing B5

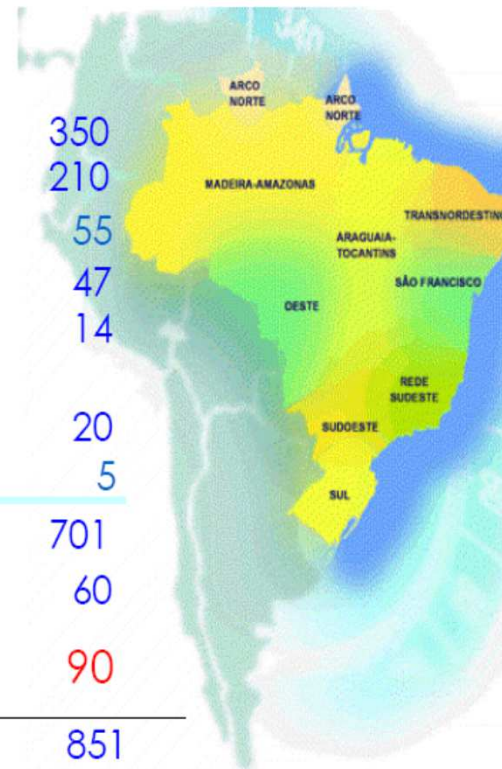
**B20 and B100 in some bus fleets  
(São Paulo, more than 3,000 buses using B20)**

# Land Use In Brazil

NATIONAL TERRITORY: 8,51 MILLION KM<sup>2</sup>

Millions of hectares

|   |            |
|---|------------|
| AMAZON FOREST .....   | 350        |
| BREEDING PASTURES .....                                     | 210        |
| PROTECTED AREAS .....                                       | 55         |
| ANNUAL CULTURES .....                                       | 47         |
| PERMANENT CULTURES .....                                    | 14         |
| CITIES, LAKES,<br>ROADS AND SWAMPS .....                    | 20         |
| CULTIVATED FORESTS .....                                    | 5          |
| <b>OTHER USES</b>   | <b>701</b> |
|   | 60         |
| <i>UNEXPLOITED AREA STILL<br/>AVAILABLE FOR AGRICULTURE</i> | <i>90</i>  |
| <b>TOTAL</b>  | <b>851</b> |



# Direct Social Impacts

2010

**103,000**  
small producers



# Jobs

2005-2010

1,300,000



lavoura

grãos



processamento



transporte



posto

# Diesel Imports

2005-2010

Diesel Imports(US\$ FOB)

**17.7 Billions**

29,367,133 m<sup>3</sup>

Amount avoid with  
biodiesel (US\$ FOB)

**3.4 Billions**

5,646,915 m<sup>3</sup>

Fonte:



# Biofuels Sustainability

- In the EU, biofuels sustainability is stipulated in the Renewable Energy Directive, which originally stated that use of biofuels must result in an overall GHG saving of 35%, in order to qualify towards the 10% biofuels target in the EU27 by 2020.



# Bio Jet Fuel

International Aviation Organizations looking just for “drop in” biofuels

Two main processes to obtain bio-isoparaffins:

Biomass Gaseification + Fischer Tropsch + Hydroisomerization

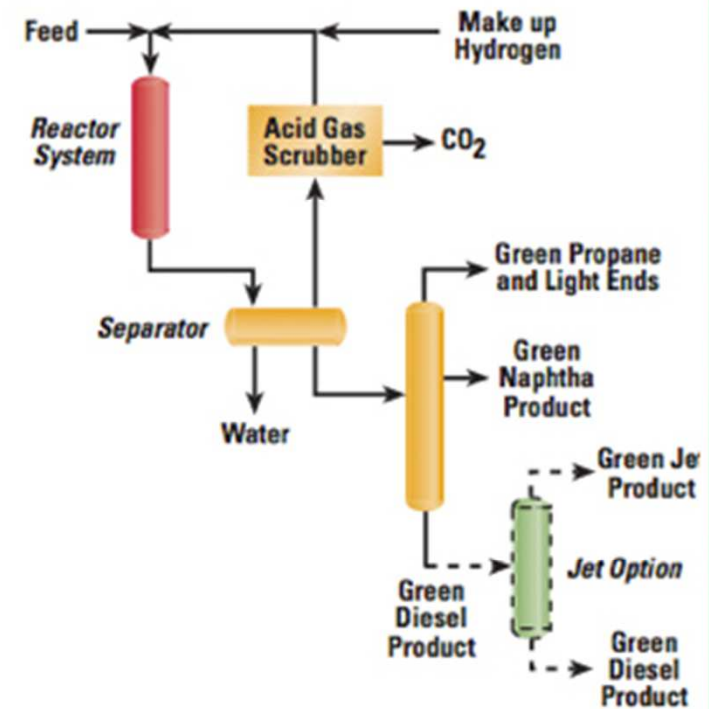
Hydrotreating Esters and Fatty Acids (HEFA)

Processes must ensure airlines, passengers, and governments that certified sustainable aviation biofuel will not displace food crops, not cause deforestation, have minimal impact to the environment, and have a positive socioeconomic effect on a region

# Bio Jet Fuel



## Ecofining Flow Diagram



# Bio Jet Fuel

Based on the UN Intergovernmental Panel on Climate Change, Aviation is accountable for approximately 3% of global carbon dioxide (CO<sub>2</sub>) emissions, which is about 13% of CO<sub>2</sub> emissions from total transportation.

Between 1990 and 2005, annual CO<sub>2</sub> emissions from global aviation grew 42%; and by 2025, emissions are forecasted to grow by 50-70%

Global aviation is traditionally among the fastest growing polluters. Furthermore, CO<sub>2</sub> emitted by aircrafts high above the ground level remains in the atmosphere, and the warming effect is twice as serious as CO<sub>2</sub> emissions on the ground. Algae, Jatropha and Camelina are the main oilcrops to this purpose

# Bio Jet Fuel

However, the aviation industry is going green and airlines are required to measure their own carbon footprint and cut emissions. The industry is taking responsibility by formulating and committing significant emission reduction initiatives based on concrete targets.

The only mandatory limits on GHG emissions from aviation were enacted by Europe, Australia, and New Zealand. Aviation will be included in the EU Emissions Trading System (ETS) beginning in 2013.

Under the Amendments, aircraft operators that fly into or out of EU airports will be required to participate in the ETS, and surrender emissions allowances equivalent to the GHG emissions associated with their flights into and out of EU airports



# FATTY ACID DEOXYGENATION FOR BIO-JETFUEL PRODUCTION



**Fatty Acid**

**Bio jet fuel**  
(1-Pd/K10, 30 bar H<sub>2</sub> e 6 h)

# First Commercial Flight in Brazil



During Rio+20 United Nations Conference on Sustainable Development

# Conclusions

Brazilian Biodiesel Program is quite successful with strong social impacts and strategical domestic energy production

Land use is not a big issue in Brazil. Sustainable associations like RSPO and RTRS are very important

Food crops like soybean not necessary a problem since soybean meal is simultaneously produced (4 times more than oil)

Biojet fuel under international carbon footprint control. Global agreements