

# Brazil and Korea on Green Growth

Elements for a cooperation agenda based on science, technology and innovation.





## COUNTRY OVERVIEW

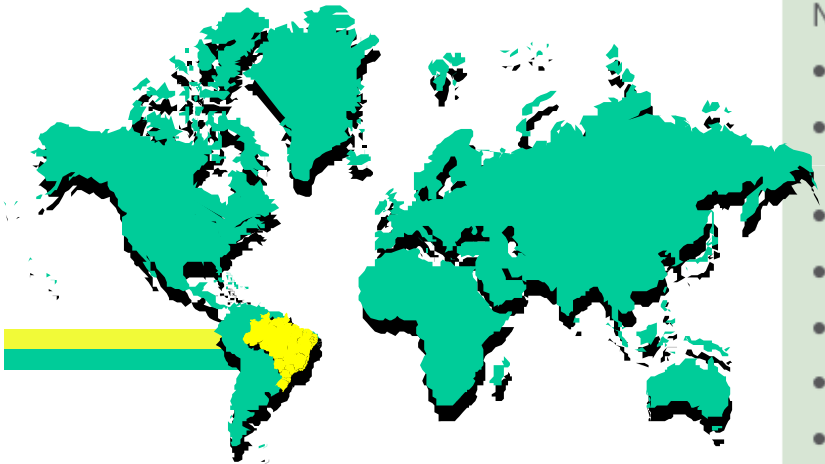
# Country Overview



- The largest economy in South America and the 10th largest in the world;
- 5th largest country in the world in area;
- 192 million inhabitants (5th after China, India, USA and Indonesia);
- Brazil has since 1985 a stable democratic government;
- 10,000 Ph.D. graduate every year;
- Rank 13th in scientific publications...

# Country Overview

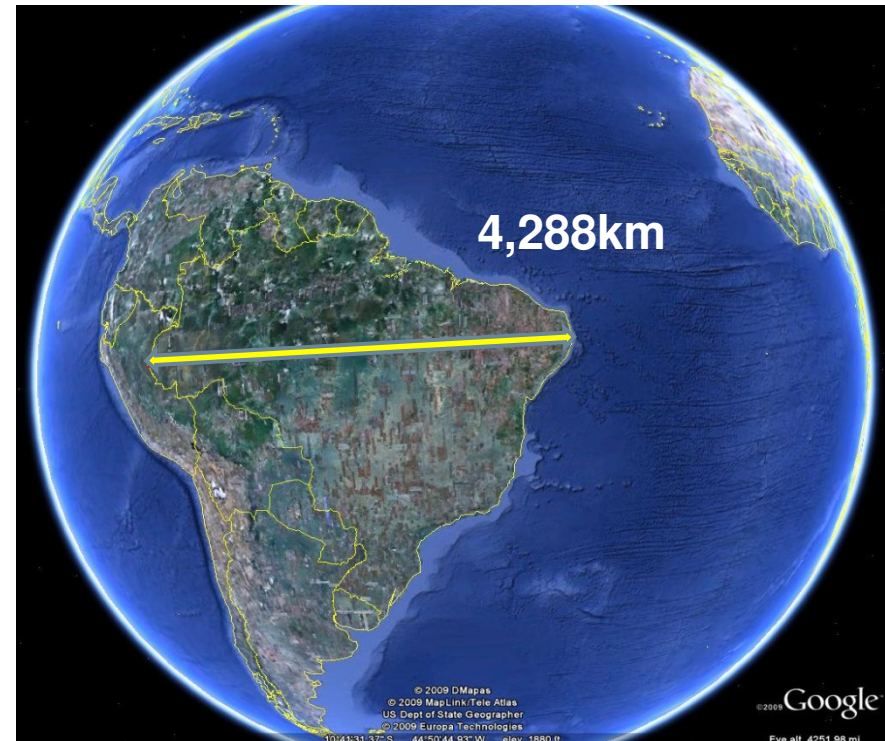
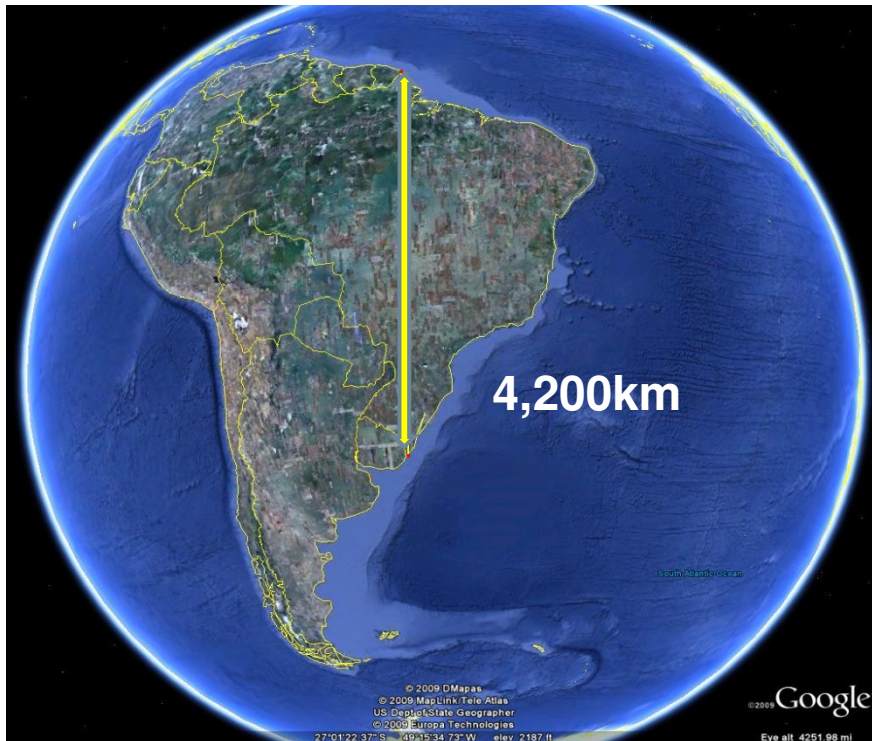
## Strong, Thriving Economy & Institutional Framework



New social and economic paradigms, with:

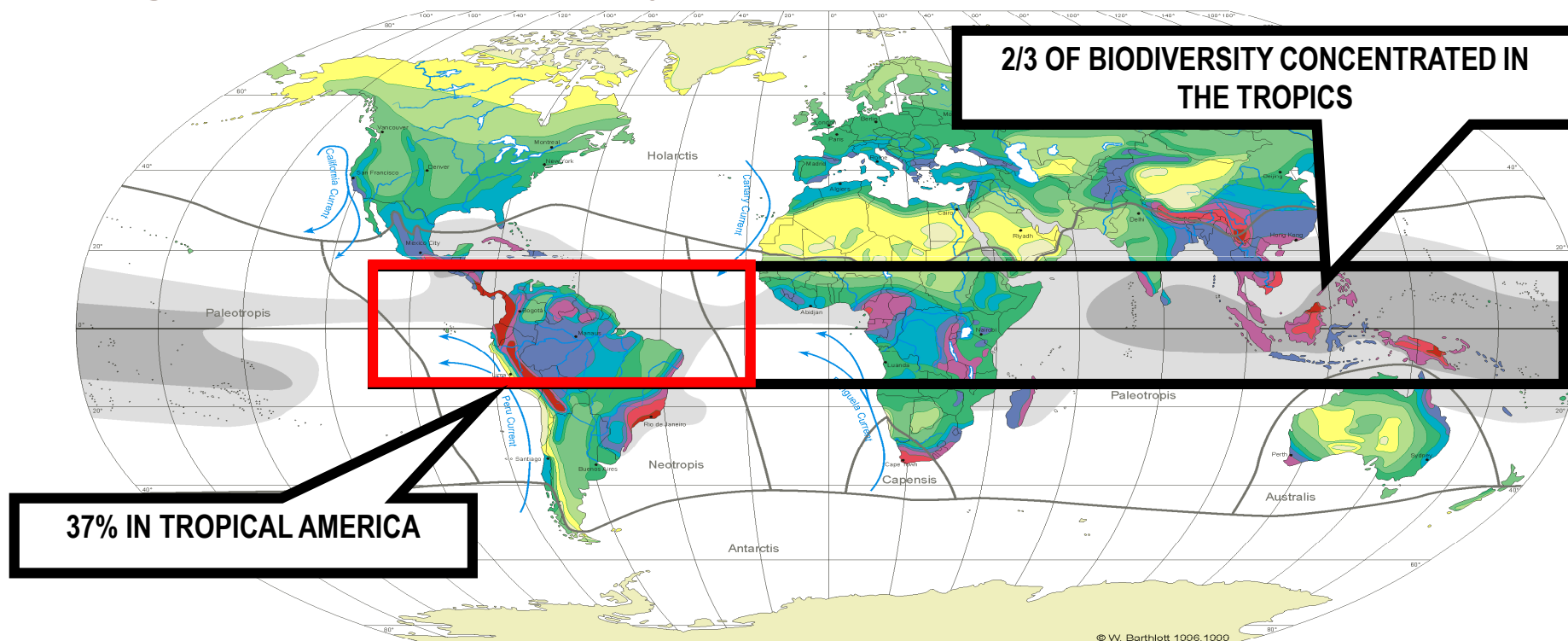
- Social inclusion and income distribution;
- Upgrowth of the middle class, ensuring solid and diversified domestic demand;
- Investment enhancement;
- Stable, consolidated democracy, legal and institutional framework;
- Infrastructure long-term investment program with strategic actions;
- Sustainable growth based on macroeconomic prudential policies;
- Inflation under control (efficient inflation target regime);
- Robust fiscal rules (primary surplus & continuous reduction of public deficit);
- Low external vulnerability.

# Country Overview



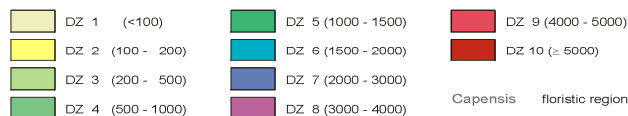
# Country Overview

## A Mega-diverse Country



Robinson Projection  
Standard Parallels 38°N und 38°S

Diversity Zones (DZ): Number of species per 10 000km<sup>2</sup>



sea surface temperature

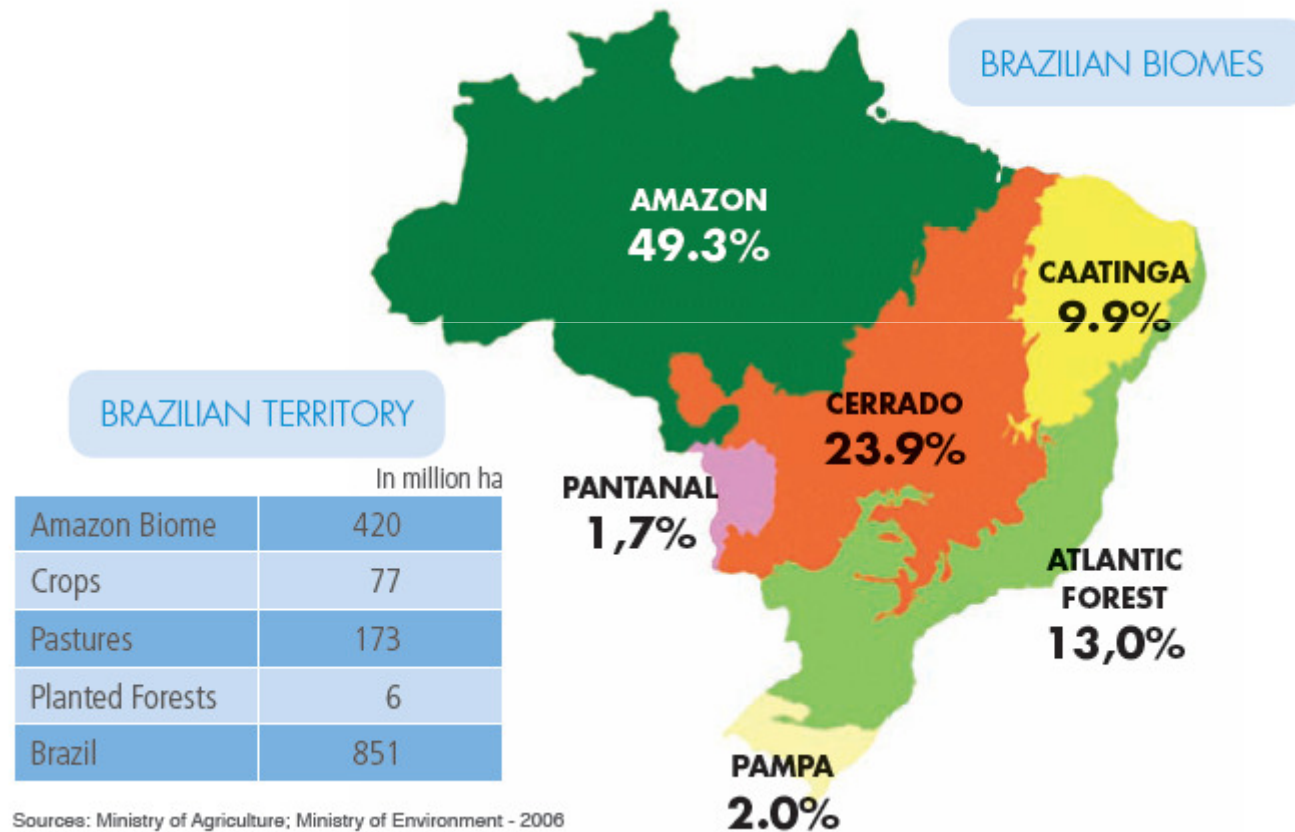


Capensis floristic regions

Blue arrow cold currents

W. Barthlott, N. Biedinger, G. Braun, F. Feig, G. Kier, W. Lauer & J. Mutke 1999 modified after W. Barthlott, W. Lauer & A. Placke 1996  
Department of Botany and Geography University of Bonn  
German Aerospace Research Establishment, Cologne  
Cartography: M. Gref  
Department of Geography University of Bonn

# Country Overview

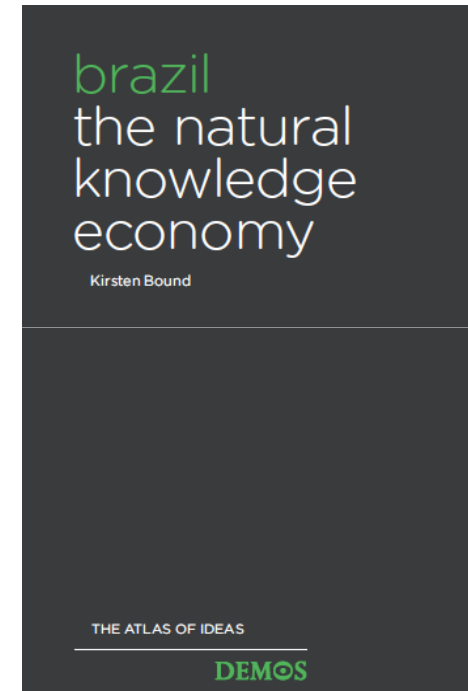


# Brazil – The Natural Knowledge Economy



## The Economist - Nov. 14-20, 2009

“A country with the world’s largest freshwater supplies, the largest tropical forests, fertile land that in some places allows up to three harvests a year, and huge mineral and hydrocarbon wealth.”



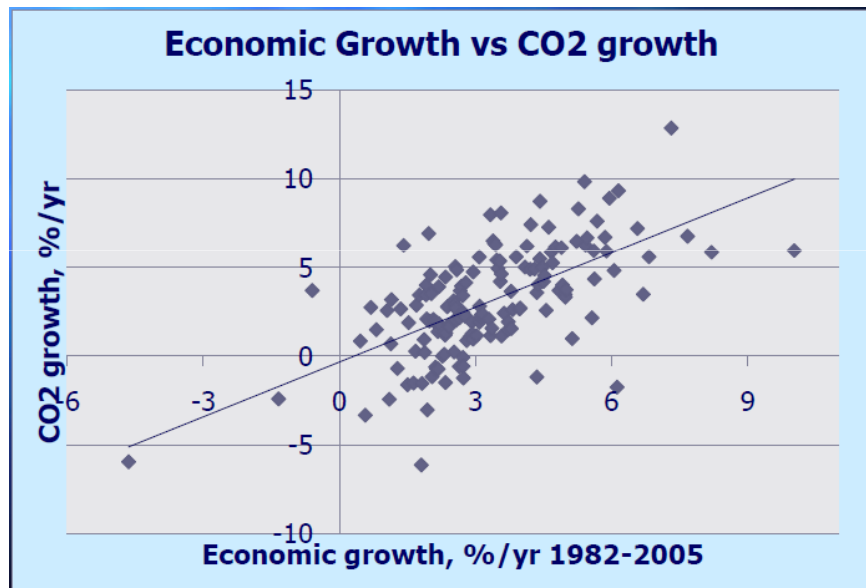
## The Atlas of Ideas – Demos Institute, 2008

“It is helpful to think of Brazil as a ‘natural knowledge-economy’... its innovation system is in large part built upon its natural and environmental resources, endowments and assets.”

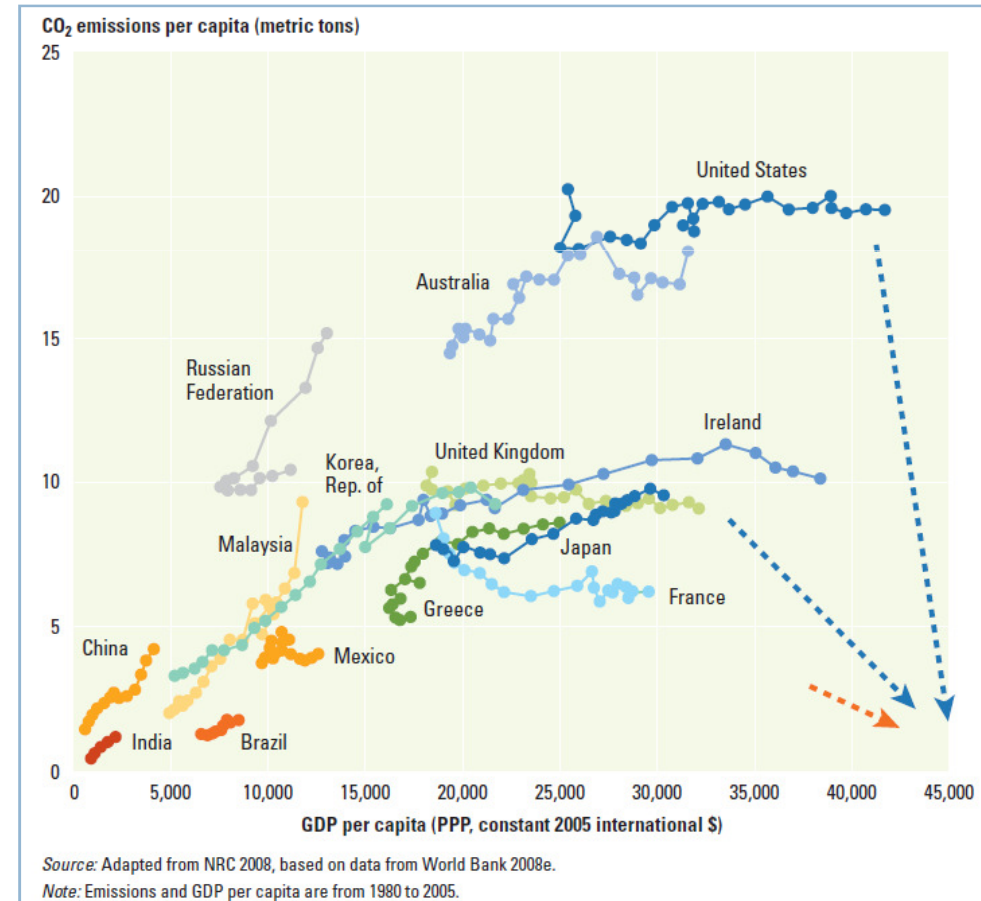


# Facing New Challenges

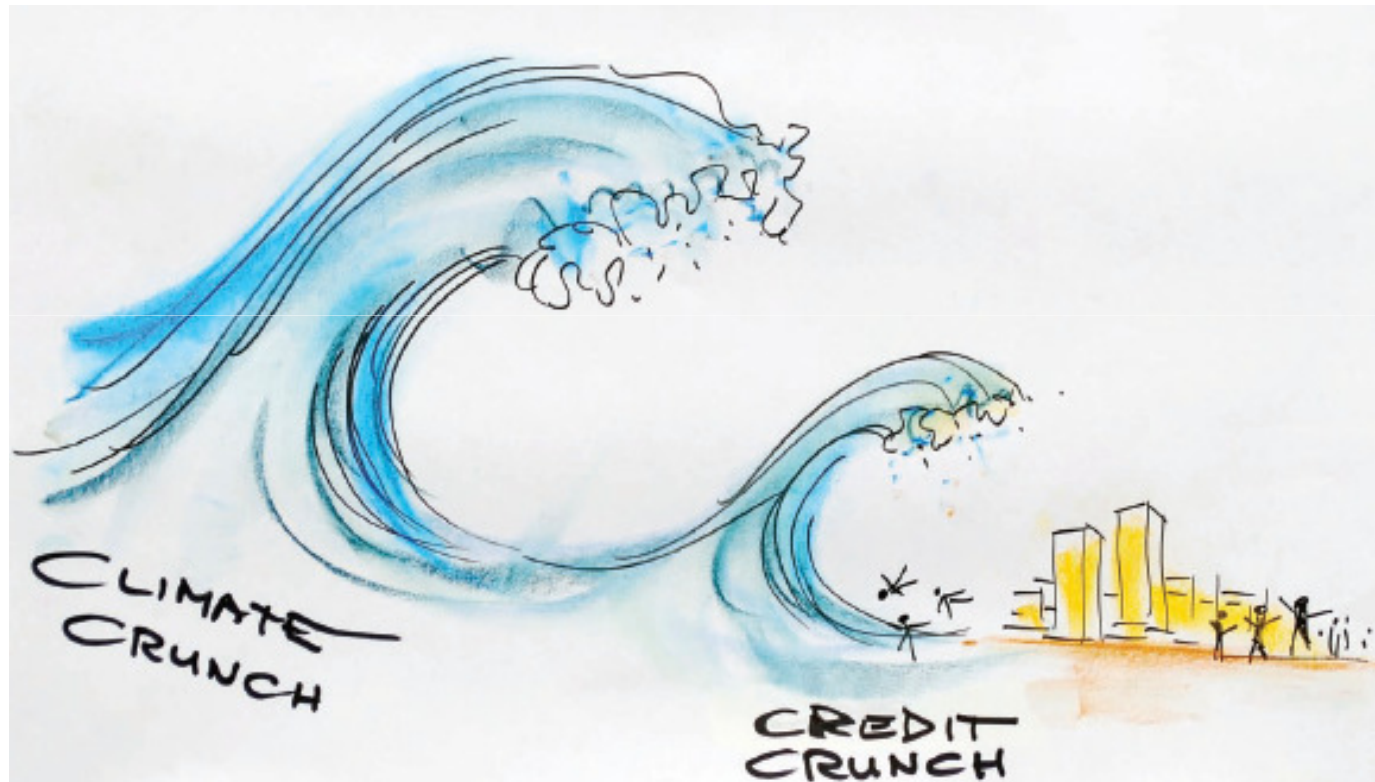
## Decoupling Development and GHG Emissions



Fonte: OECD, 2009; Lomborg, 2010.



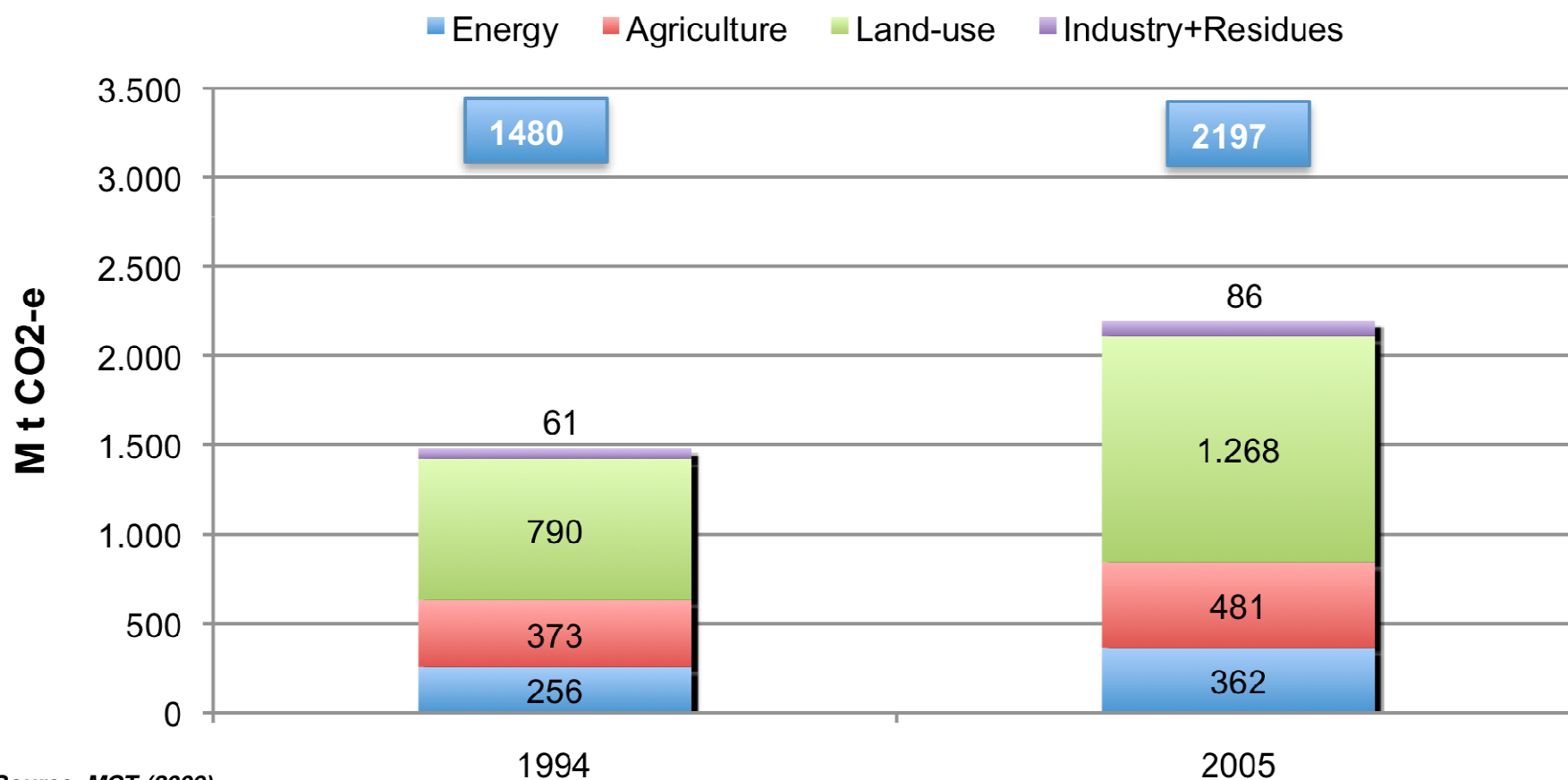
# Facing New Challenges



Source: Foresight for Smart Globalization: Accelerating & Enhancing Pro-Poor Development Opportunities  
The Rockefeller Foundation – October 2009

# Global Change – Challenges to Brazil

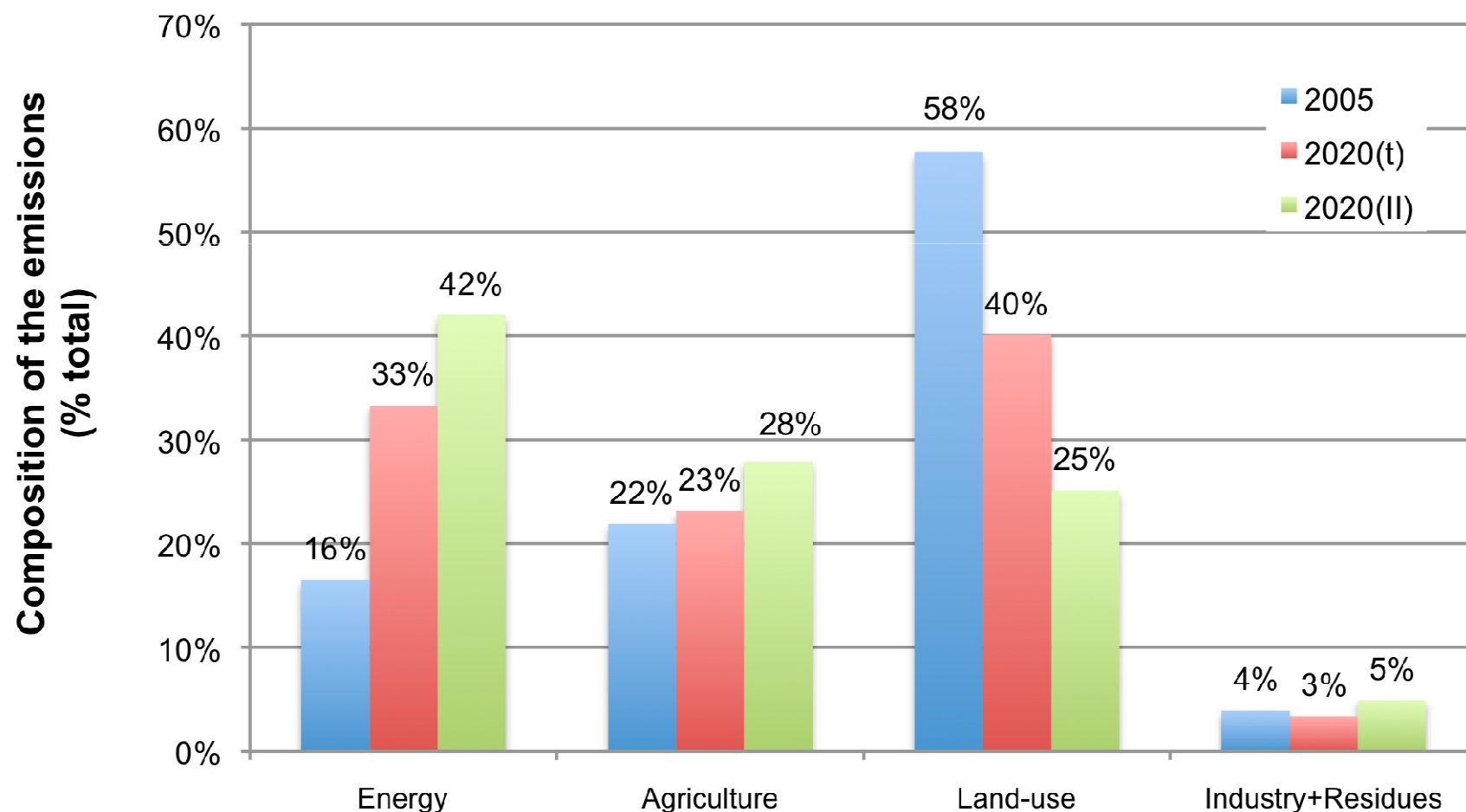
## Brazilian GHG Emissions



Source: MCT (2009).

# Global Change – Challenges to Brazil

## Brazilian GHG Emissions



Source: MCT (2009).

# Global Change – Mitigation Plan

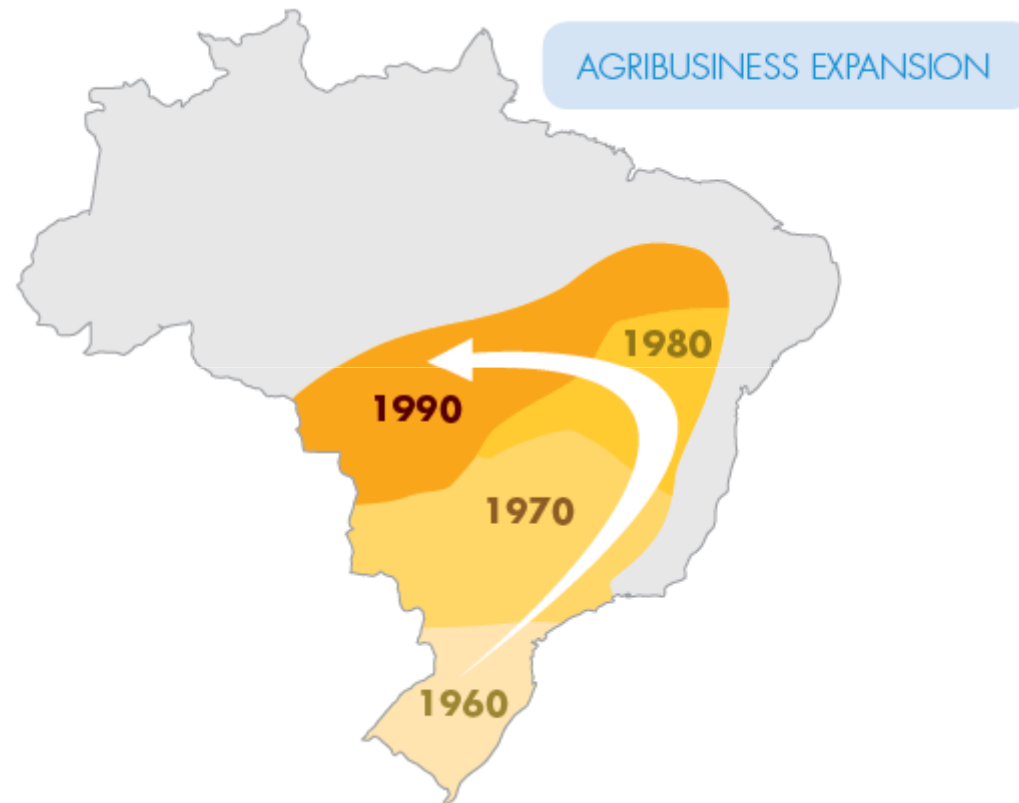
Mitigation Actions	2020-trend	Emission reduction range		Reduction relative to trend		Reduction	
NAMAs	(M t CO <sub>2</sub> -e)	(M t CO <sub>2</sub> -e)		%		% total reduction	
<b>Land-use</b>	1084	669	669	24,70%	24,70%	68,42%	63,50%
Reduced deforestation-Amazonia		564	564	20,90%	20,90%	57,89%	53,73%
Reduced deforestation-Cerrado		104	104	3,90%	3,90%	10,80%	10,03%
<b>Agricultural sector</b>	627	133	166	4,90%	6,10%	13,57%	15,68%
Pasture recovery		83	104	3,10%	3,80%	8,59%	9,77%
Crop-livestock systems		18	22	0,70%	0,80%	1,94%	2,06%
No-till planting		16	20	0,60%	0,70%	1,66%	1,80%
Biological N-fixation		16	20	0,60%	0,70%	1,66%	1,80%
<b>Energy sector</b>	901	166	207	6,10%	7,70%	16,90%	19,79%
Energy efficiency		12	15	0,40%	0,60%	1,11%	1,54%
Increased biofuel use		48	60	1,80%	2,20%	4,99%	5,66%
Increased hydroelectrical power		79	99	2,90%	3,70%	8,03%	9,51%
Increased alternatives sources		26	33	1,00%	1,20%	2,77%	3,08%
<b>Others</b>	92	8	10	0,30%	0,40%	0,83%	1,03%
Siderurgy (mineral x vegetal coal)		8	10	0,30%	0,40%	0,83%	1,03%
<b>Total</b>	2703	975	1052	36,10%	38,90%	100,00%	100,00%

Source: MCT (2009).

# Green Growth Brazil - Agriculture



# Green Growth Brazil - Agriculture

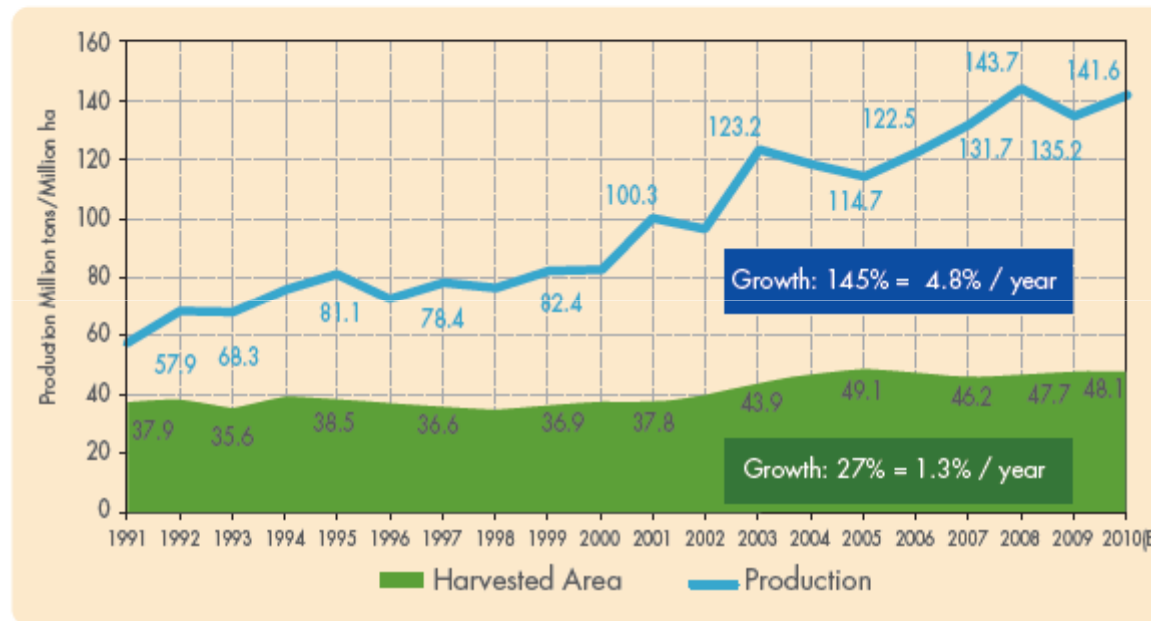


**Agricultural production started primarily in the Southern region and, later on, expanded to other areas towards the middle-west of the country.**

**High levels of productivity as a result of investments in tropical technology allow coexistence of expansion of food and energy production, along with environmental protection.**

# Green Growth Brazil - Agriculture

## Grain - Production and Area



Source: National Company of Food Supply

**Increase in grain production over the last 20 years has been a result of high levels of productivity. Grain volume has increased by 2.5 in the period, while the harvested area has grown less than 30%. Productivity in the area, therefore, doubled, thus avoiding expansion to sensitive biomes.**



# Green Growth Brazil - Agriculture

## 2009 Ranking: Brazilian Production and Exports

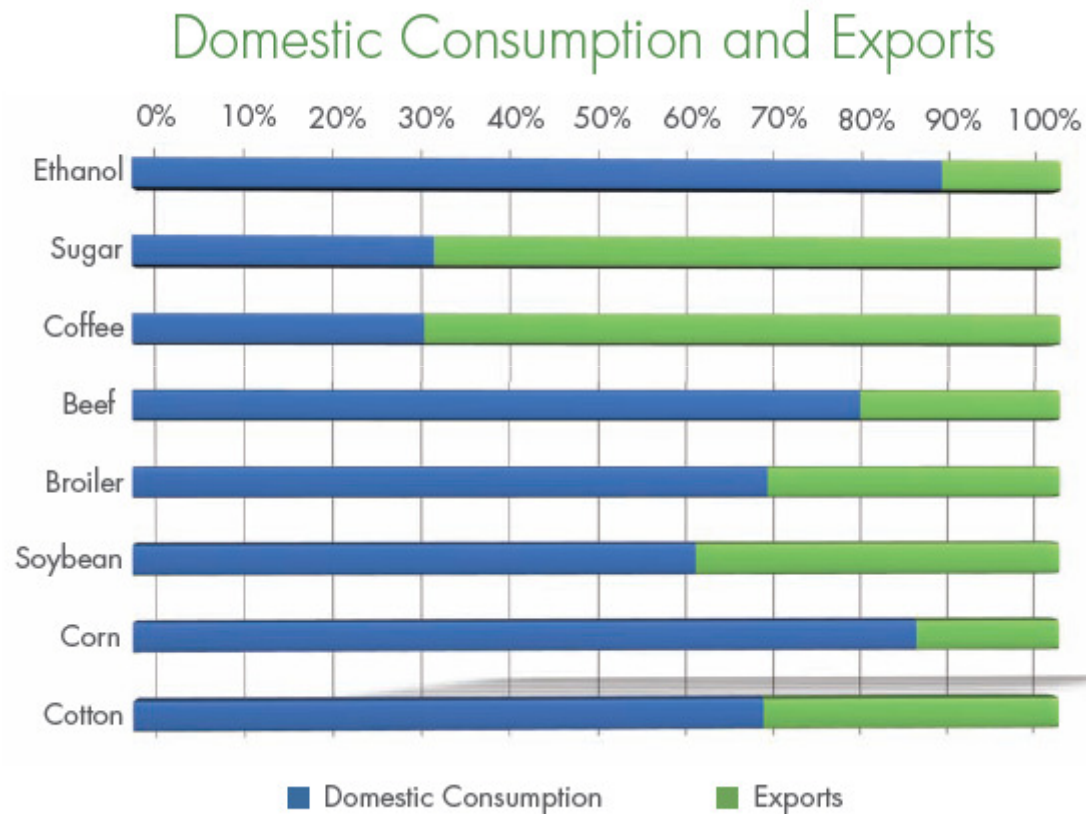
Main Products	Production	Exports	Number of Markets	Exports US\$ Billion
Sugar	1 <sup>st</sup>	1 <sup>st</sup>	124	8.378
Coffee	1 <sup>st</sup>	1 <sup>st</sup>	81	3.762
Orange Juice	1 <sup>st</sup>	1 <sup>st</sup>	75	1.619
Soybean	2 <sup>nd</sup>	2 <sup>nd</sup>	46	11.413
Beef	2 <sup>nd</sup>	1 <sup>st</sup>	142	4.118
Tobacco	2 <sup>nd</sup>	1 <sup>st</sup>	100	2.992
Ethanol	2 <sup>nd</sup>	1 <sup>st</sup>	48	1.338
Broiler	3 <sup>rd</sup>	1 <sup>st</sup>	146	5.307
Corn	4 <sup>th</sup>	3 <sup>rd</sup>	49	1.259
Pork	4 <sup>th</sup>	4 <sup>th</sup>	81	1.225

Sources: USDA, Ministry of Agriculture

**Brazil plays a leading role as a global supplier of agricultural products, exporting for more than 180 markets.**

**Diversified product range helps enhance food security for the world.**

# Green Growth Brazil - Agriculture



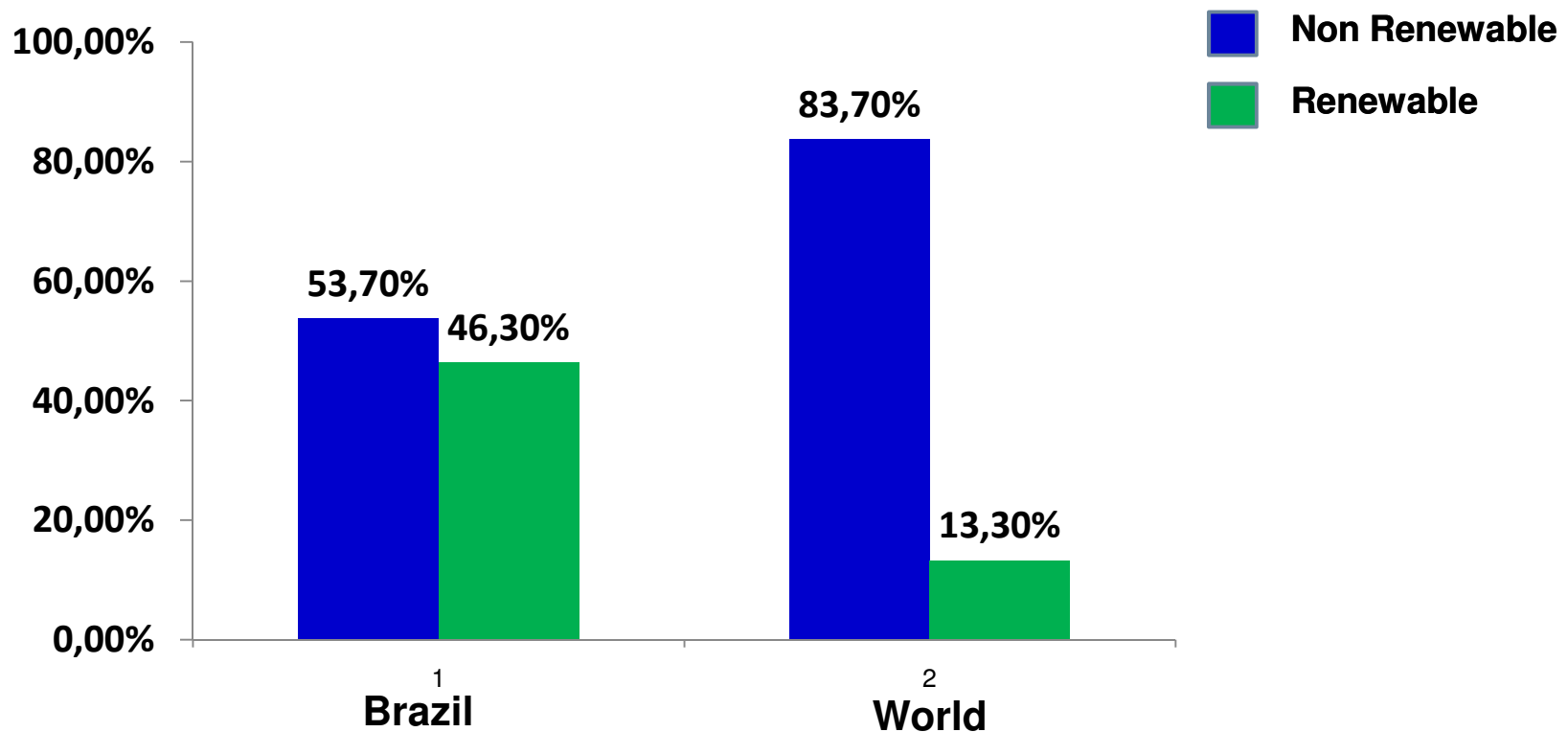
Sources: Ministry of Agriculture, Brazilian Institute of Geography and Statistics - 2009

**Roughly 70% of the Brazilian agricultural production aims the national market. Domestic demand ensures critical mass for market predictability, enabling expansion planning.**

# Green Growth Brazil - Agriculture

## Agriculture in Brazil – Food, Feed, Fiber and Fuel

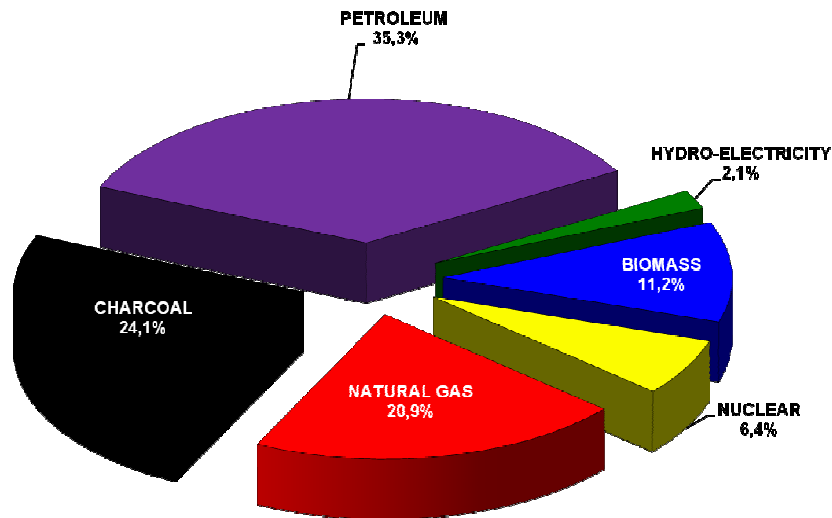
Brazilian vs World Energy Matrix



# Green Growth Brazil - Energy

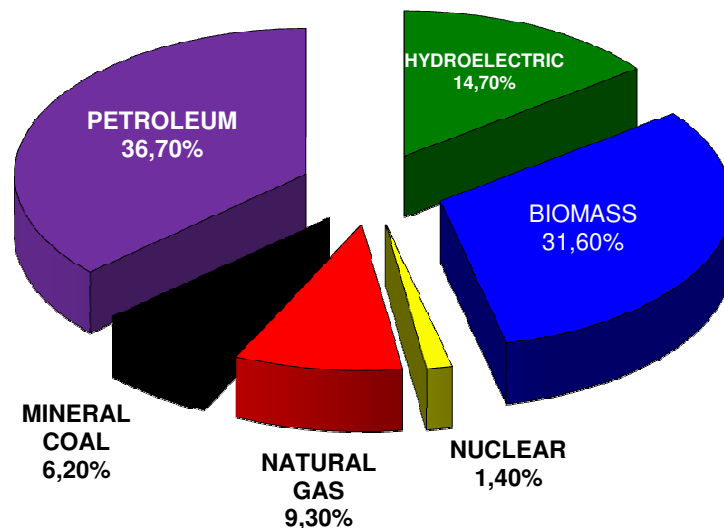
## Brazilian vs World Energy Matrix

### World Energy Matrix



Source: IEA, 2008.

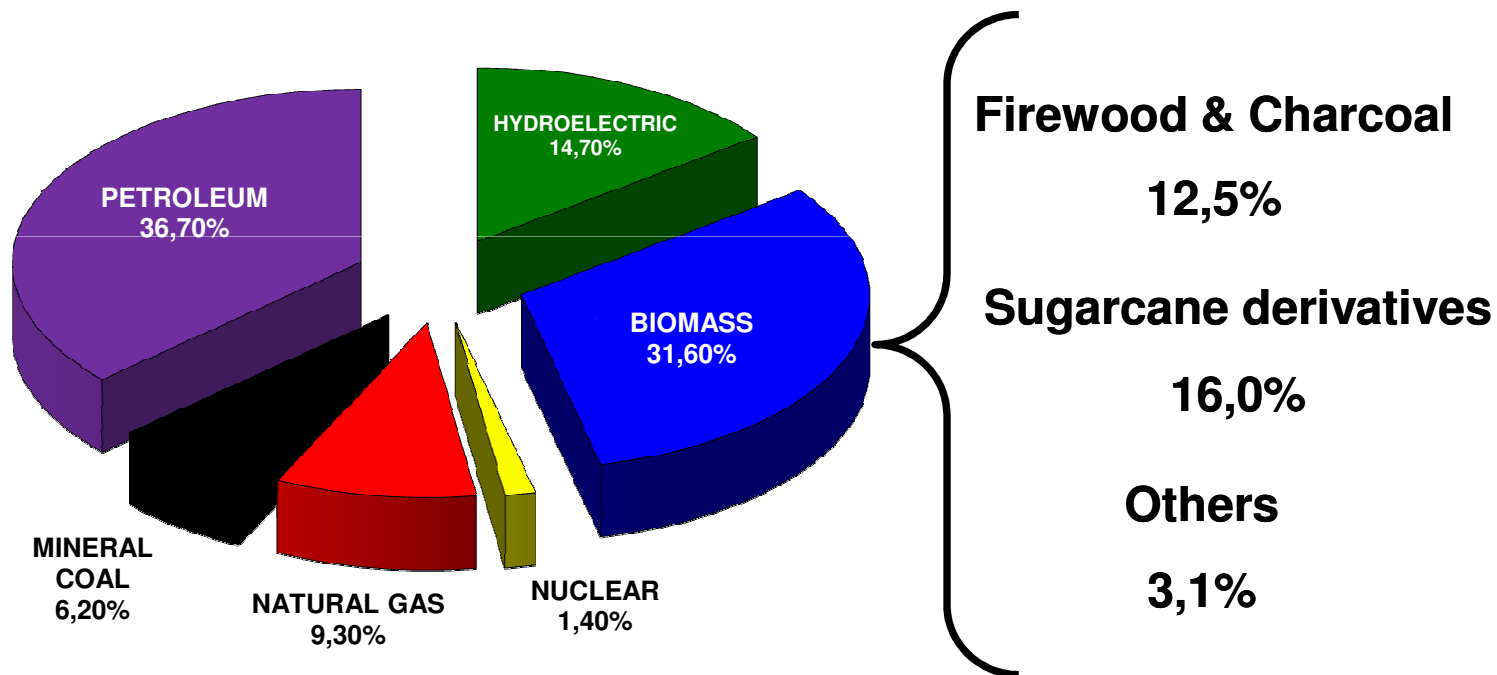
### Brazilian Energy Matrix



Source: EPE, 2008.

# Green Growth Brazil - Energy

## Brazilian Energy Matrix (% Composition)



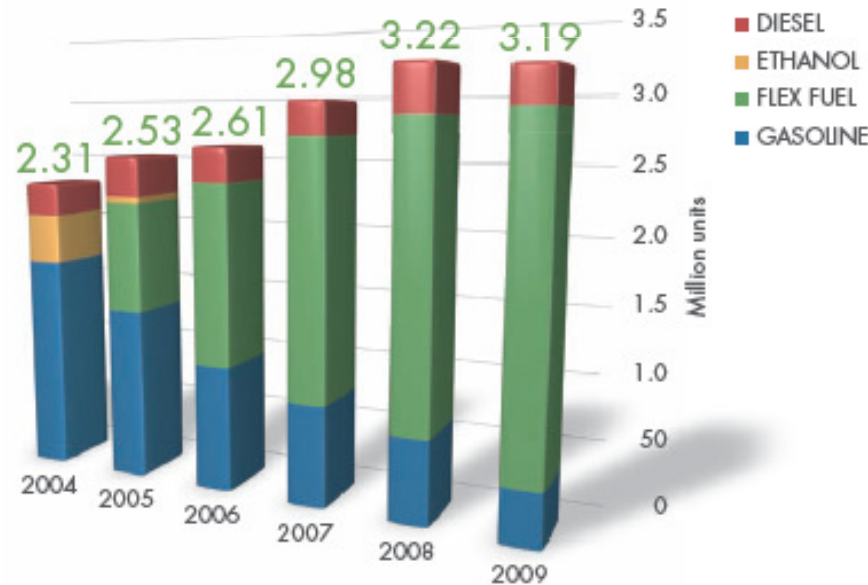
Sugarcane surpassed hydroelectric power in the Brazilian energy matrix. Everything indicates that sugarcane will have growing importance in the country's energy matrix.

# Green Growth Brazil - Energy

## Sugarcane Ethanol as Energy Source in Brazil

More than 95% of light cars sold in Brazil are Flex-Fuel

Flex-fuel Cars – Evolution



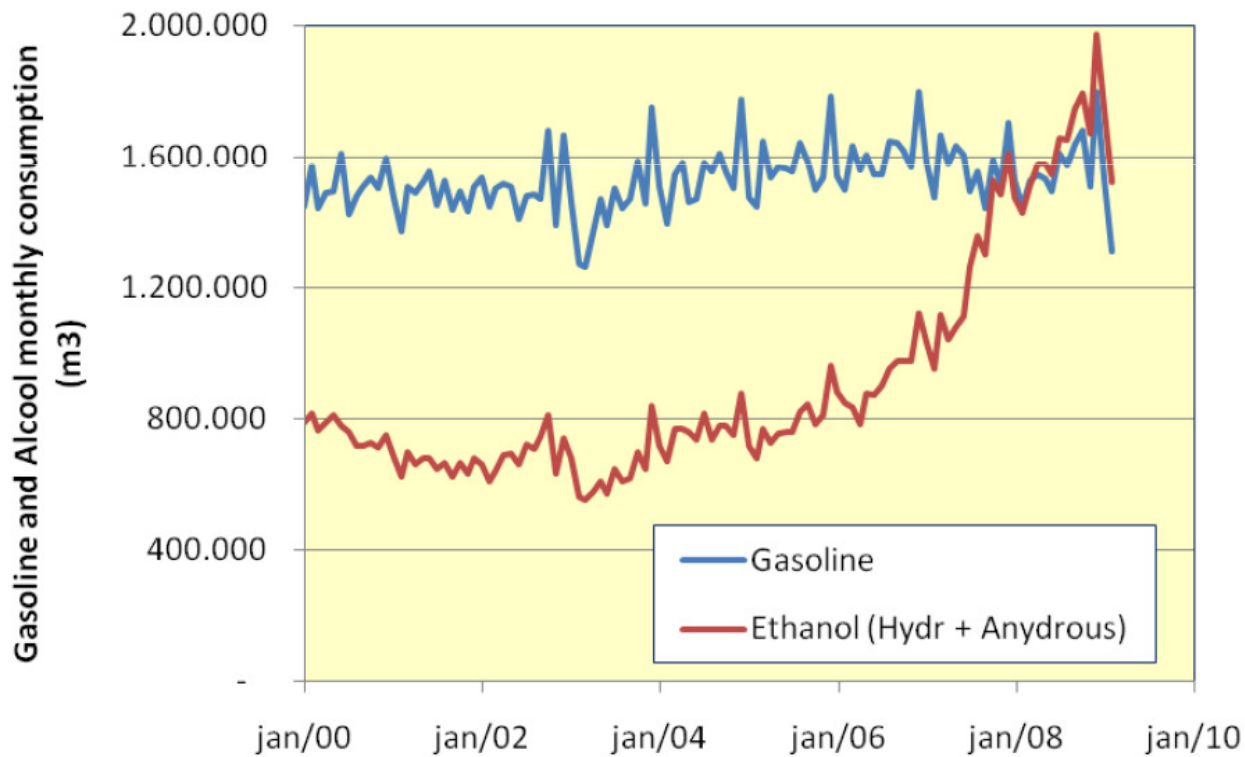
Source: Anfavea  
Elaboration: Ministry of Agriculture



# Green Growth Brazil - Energy

Gasoline is Becoming the Alternative Fuel in Brazil

Changes in Ethanol and Gasoline use in Brazil



Source: ANP, 2009 and Brito Cruz, 2009

# Green Growth Brazil - Energy

## Sugarcane Bagasse as Energy Source in Brazil



**Mills and distilleries also generate electric and mechanical power, most of it for self consumption. That is equivalent to 3% of the electric power consumed in the Brazil.**

**For every additional 100 million tons of sugar-cane, 12.6 million tons of CO<sub>2</sub> equivalent worth of emissions could be avoided using ethanol, the bagasse and the additional electric power surplus.**



# Green Growth Brazil - Energy

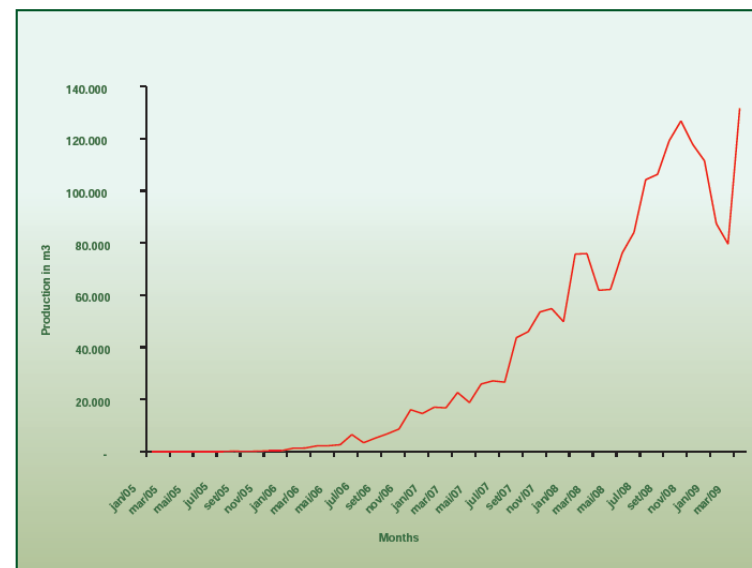
## Biodiesel production in Brazil, in m<sup>3</sup>.

MONTHS	2005	2006	2007	2008	2009
JANUARY	2005	2006	2007	2008	2009
FEBRUARY	0	1.075	17.109	76.784	87.394
MARCH	0	1.043	16.933	77.085	79.658
APRIL	8	1.725	22.637	63.680	131.700
MAY	13	1.786	18.773	64.350	
JUNE	26	2.578	26.005	75.999	
JULY	23	6.490	27.158	102.767	
AUGUST	7	3.331	26.718	107.786	
SEPTEMBER	57	5.102	43.959	109.534	
OCTOBER	2	6.735	46.013	132.258	
NOVEMBER	34	8.581	53.609	126.817	
DECEMBER	281	16.025	56.401	117.803	
TOTAL YEAR	285	14.531	49.016	111.515	
TOTAL ANO	736	69.002	404.329	1.166.379	298.752

Source: ANP

## Other sustainable energy sources - Biodiesel

### Monthly biodiesel production in Brazil, in m<sup>3</sup>.



Source: ANP

# Green Growth Brazil – Land Use



Source: Ministry of Agriculture, Brazilian Institute of Geography and Statistics

Since 2006, private representatives of the soybean segment declared “moratorium” to the soybean produced in the Amazon Biome - a comprehensive commitment prohibiting to buy or sell the product of such region. Satellite monitoring controls the origin of the product and ensures the rain Forest protection.

# Green Growth Brazil – Land Use

**Brazil increases environmental preservation measures with sugarcane zoning proposal**



**New bill based on a zoning plan developed by Embrapa establishes that areas for cultivation of sugarcane may reach a maximum of 64 million hectares.**

# Green Growth Brazil – Land Use

## Brazil increases environmental preservation measures with sugarcane zoning legislation



**Coupled with the areas not suitable for sugarcane farming, the Bill will effectively make 92.5% of Brazil's national territory off-limits for sugarcane farming and processing, thus suppressing expansion into sensitive biomes.**

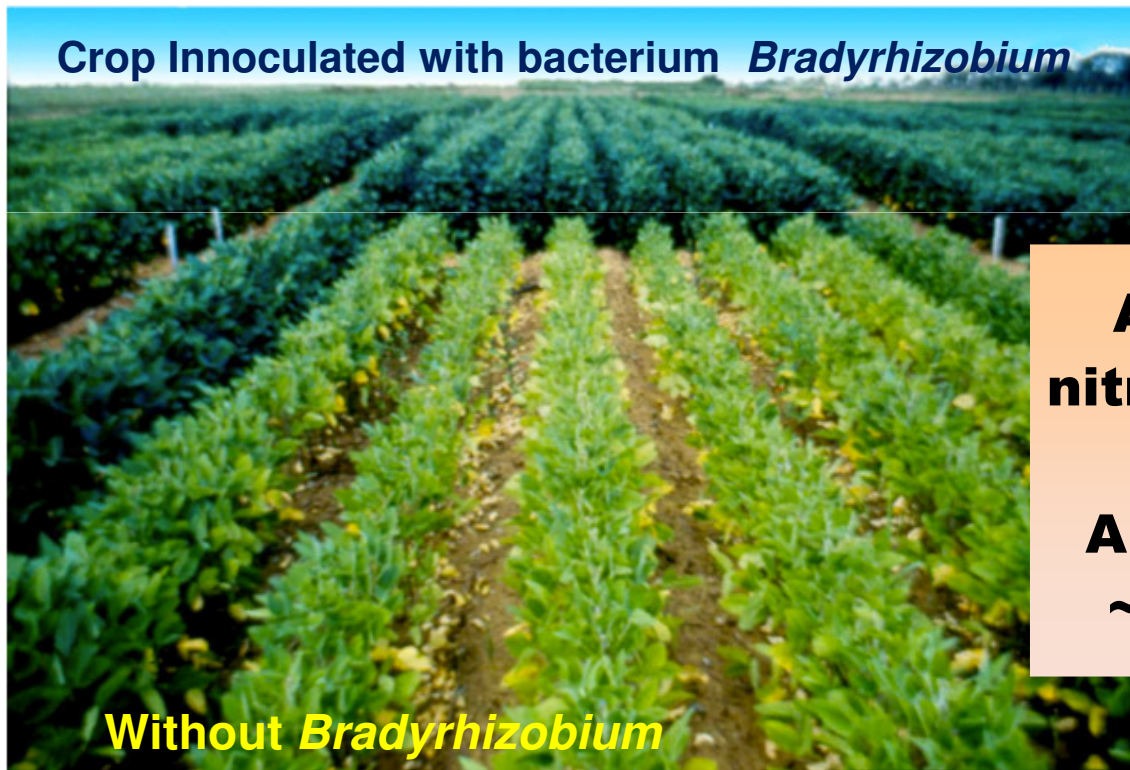
# Green Growth Brazil – New Industry Paradigms

“Green Cars”



# Green Growth Brazil – New Industry Paradigms

## “Biological Nitrogen Fixation”



**Avoids use of  
nitrogen fertilizers**

**Annual economy:  
~ US\$ 5 billion**

# Green Growth Brazil – New Industry Paradigms



RELEASE

15/6/2010 09:06:00

## BRASKEM LAUNCHES A SEAL FOR ITS PRODUCTS FROM RENEWABLE SOURCES

*Developed to satisfy the global market, the I'm green seal is created to distinguish products that have Braskem's green plastic in their composition*

**I'm  
green**



**Plastic**

Renewable source  
Carbon reduction

**Braskem**

Braskem is about to become world leader in the production of biopolymers when it puts in operation its first industrial plant for green ethylene in the middle of next semester. The plant will make it possible to produce 200 thousand tons/year of polyethylene from sugar cane ethanol. Now the company takes yet another step towards its commitment to sustainability by launching the I'm Green seal. The objective is to create value and to identify all of its polymers produced from renewable raw materials.

# Green Growth Brazil – New Industry Paradigms

## Ethanol-Powered Crop Dusters

A Brazilian aircraft maker is selling more ethanol-powered crop dusters these days.

**Embraer** is one of the largest aircraft manufacturers in the world, including commercial and corporate jets as well as defense systems. The company has a subsidiary called Neiva that specializes in smaller planes, like the Ipanema, a low-wing agricultural monoplane – or crop duster.

According to **Wired**, Neiva recently delivered its 50th ethanol-powered Ipanema.



*Since 1973, Neiva has sold over 1,000 of the crop dusters, most of them in the Latin American market. The company began selling ethanol versions of the plane in 2002, which makes sense, considering that Brazil is one of the top ethanol producers in the world.*

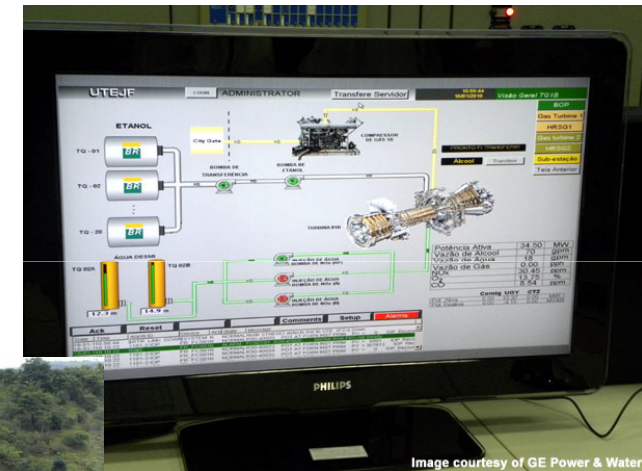
Embraer also has been selling ethanol conversion kits for earlier versions of the plane. According to the company, in addition to reducing fuel costs, converting an Ipanema to ethanol cuts maintenance and operating costs by 20%.

The Ipanema was the first aircraft in the world certified for ethanol operations. Embraer is now reportedly spending \$250 million to investigate alternative jet fuels made from babassu, jathopa and algae.



# Green Growth Brazil – New Industry Paradigms

## Ethanol Power Plant, Brazil



Juiz de Fora power generation station is powered by two 43MW GE LM6000 PF gas turbines

# Green Growth Brazil – New Industry Paradigms

Special fibers - Naturally colored cotton – no use of industrial dye



Foto: Natural Fashion



Foto: Natural Fashion



<http://www.cnpa.embrapa.br/jornal/embrapainfo1.html>



Mocelânia de cores do algodão  
trabalhado na Embrapa



<http://www.mundocor.com.br/algodaocolor.htm>



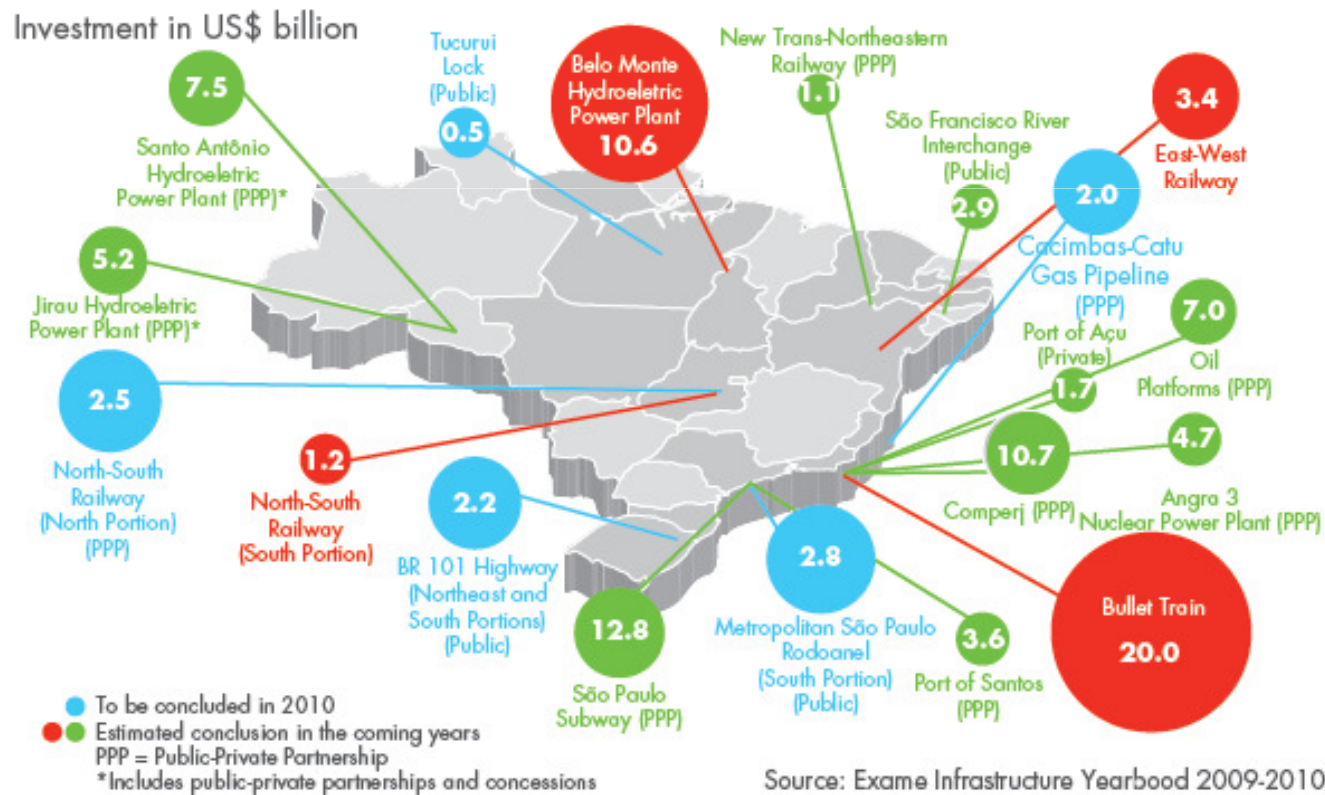
Foto: Natural Fashion



Foto: Natural Fashion

# Green Growth Brazil – Infrastructure

## Accelerated Growth Programme Infrastructure to Come



# Green Growth Brazil – Korea



Perspectives for a cooperation agenda based on  
science, technology and innovation

# Brazil and Korea relations

- 50 years of diplomatic relations
- Since 1959: Several agreements of trade, immigration and law.
- 1991: Science and Technology Cooperation.
- 2005: Peaceful Use of Nuclear Energy Agreement.
- 2010: First Joint S&T Committee in Seoul.



# Brazil and Korea relations

- Traditional partners on trade
  - ▣ 42 private Korean companies in Brazil;
  - ▣ Relevant institutions: KOTRA, Exim Bank, KDB, SMBA among others;
  - ▣ Trade boost from U\$2bi in 2002 to U\$8.5bi in 2008
- Dawn of joint ventures
  - ▣ KOBRASCO:
    - Posco + Vale → steel
  - ▣ HT Micron:
    - Hana Micron + Altus → semiconductors



# Science and Technology



- Agricultural Innovation – Biotech, Bioenergy, Genetic Resources

- Labex Korea



- Rural Development Administration
- Brazilian Agricultural Research Corporation



- Neglected Diseases

- Institute Pasteur Korea
- Fiocruz



# Science and Technology



**Labex Korea**Brazil-Asia Cooperation in Agricultural Research


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**ENTRIES CATEGORIZED AS 'BRAZIL-KOREA COOPERATION'**

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## Brazilian Presence in the Korean Science and Technology Scene

*April 26, 2010 · Leave a Comment*




Mauricio Lopes, Daniel Fink and Lucio Freitas-Junior are paving the way for a Brazil-Korea Science and Technology cooperation.

One year ago, the Seoul-based English Newspaper Korea Herald published the article [Brazil, Korea emerging together](#), stating that “when you look closely at the relationship between Brazil and Korea you see that Brazil is a country in the hearts and minds of Koreans”. The article goes on saying that “business and trade relations between Korea and other countries are more often than not very promising, but add Brazil to the equation and the possible future can be astronomical”.

**EMBRAPA LABEX**

The concept of Virtual Laboratory – or Labex, was created by the Brazilian Agricultural Research Organization, Embrapa, as means of increasing its scientific and technological ties with advanced research organizations around the world. Instead of building its own platform abroad, Embrapa uses the concept of virtual lab, or lab without walls, to negotiate access to its partner organizations' existing facilities. The concept, which has been tested and validated in the United States and in Europe, is now being extended to Asia, in partnership with the Rural Development Administration – RDA, of South Korea. More [here](#).

**PARTNER IN KOREA**

Labex Korea is hosted by [Rural Development Administration](#)



# Science and Technology



- Information Technology
  - Cloud Computing
    - ETRI – SERPRO
  - Cognitive Radio
    - ETRI – INATEL
- Aerospace
  - Satellite images
    - KARI - AEB



IT R&D Global Leader

**ETRI**

**SERPRO**

**KARI**  
한국항공우주연구원  
KOREA AEROSPACE RESEARCH INSTITUTE

MINISTÉRIO DA CIÊNCIA E TECNOLOGIA  
**AEB**  
AGÊNCIA ESPACIAL BRASILEIRA

# Science and Technology



- Nuclear Energy
  - New power plants in Brazil
    - KAERI – CNEN



# Education



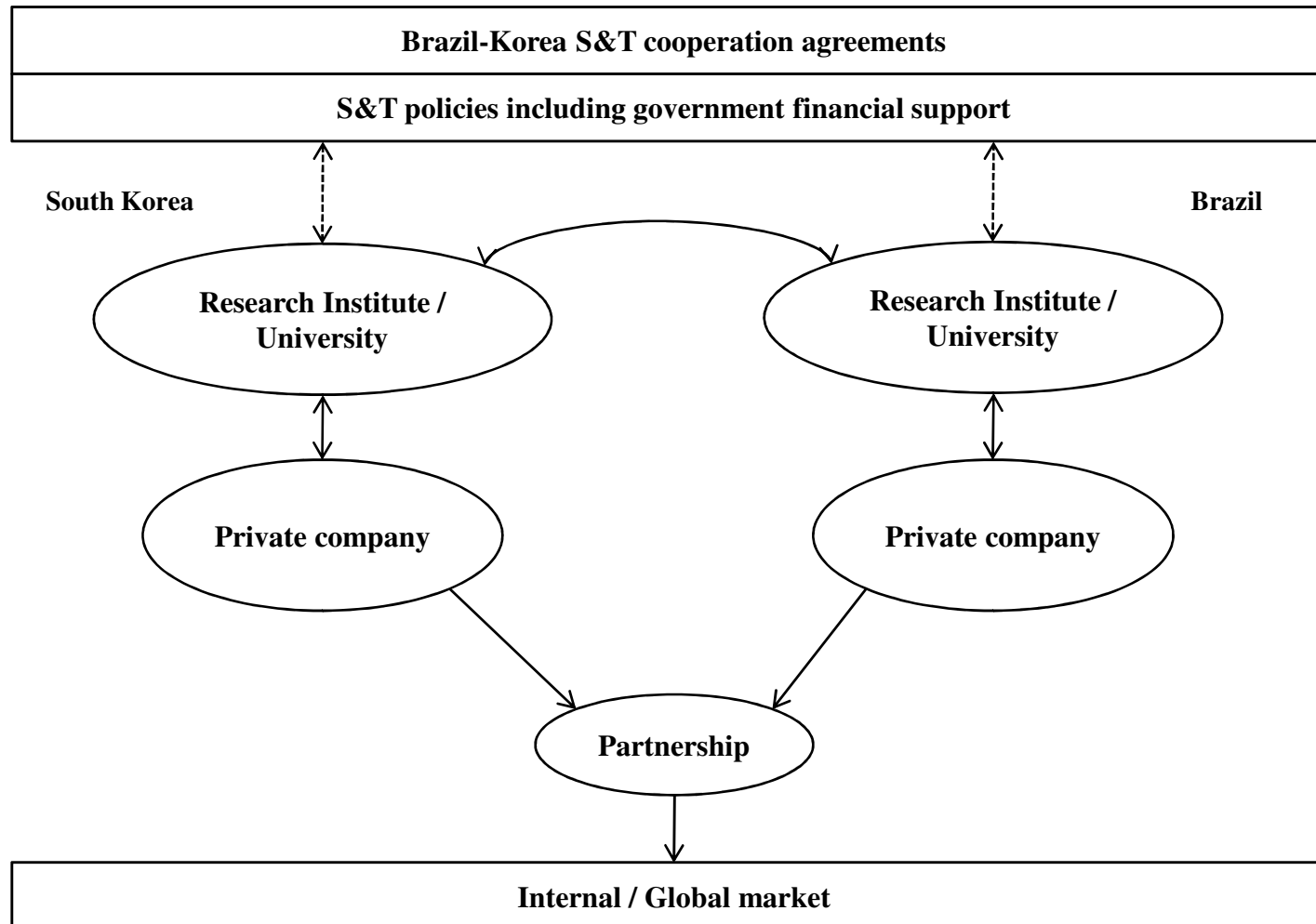
- Education
  - Foreign Students
    - Hankuk University
    - UFRGS



- Engineering
  - KAIST
  - USP University of Sao Paulo

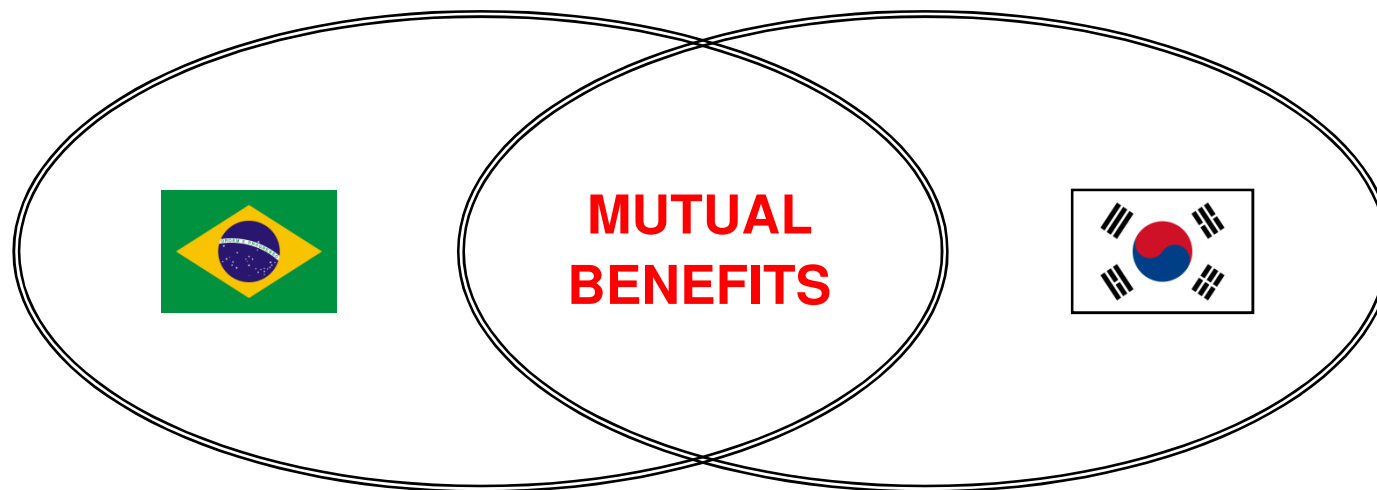


# The 2+2 model



# Brazil-Korea Cooperation

**It is feasible to think about a strong collaboration between a resource-rich country, such as Brazil, and an innovation-driven country, such as Korea, to jointly pursue a scientific and technological advances in the green growth arena.**



**Thank You - 감사합니다** 

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Korea, in Suwon, Republic of Korea.**

**Email: [labexkorea@ymail.com](mailto:labexkorea@ymail.com)**



*See you in Brazil!*

