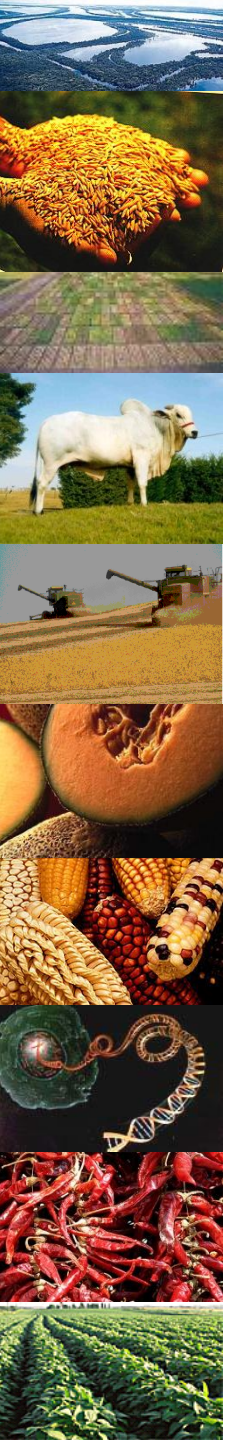


Agricultural Innovation and Challenges for Promotion of Knowledge and Information Flows in Agrifood Systems in Brazil

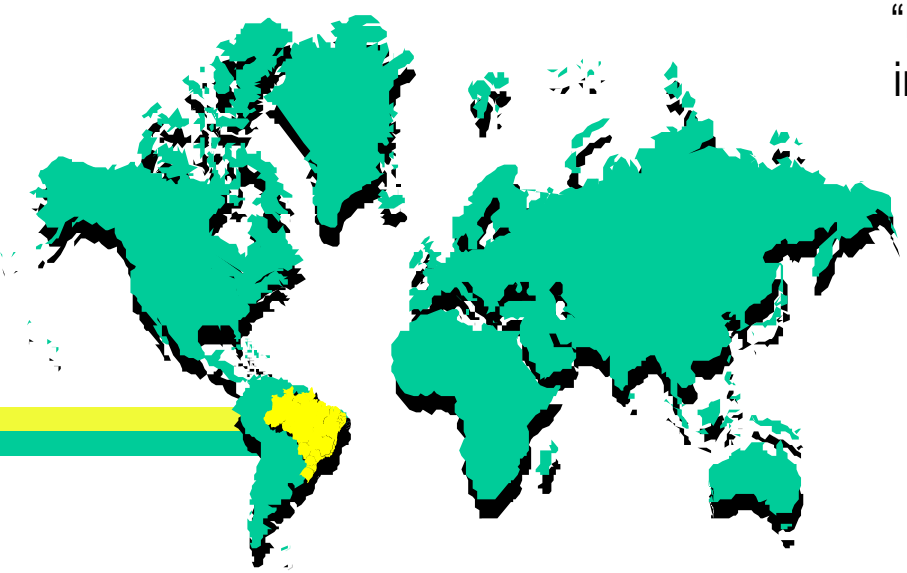
Maurício Antônio Lopes, PhD
Executive Director – Research and Development
Brazilian Agricultural Research Corporation – Embrapa
Brasília, DF, Brazil

OECD Conference on Agricultural Knowledge Systems (AKS):
Responding to Global Food Security and Climate Change Challenges
OECD Conference Centre, Paris, 15-17 June 2011

AGRICULTURAL RESEARCH · INNOVATION · QUALITY OF LIFE

Ministry of Agriculture, Livestock and Food Supply

Objectives



Purpose of the Conference:

"Explore how to foster the development and adoption of innovation at national and global levels in order to meet global food security and climate change challenges."

Session 3.D.

"Facilitating adoption of innovations and technology transfer "

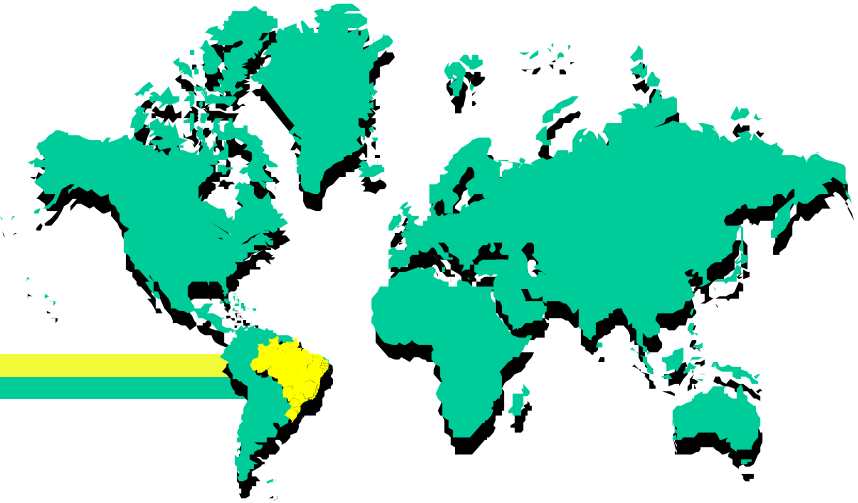
Questions:

How to encourage innovations that are needed?

How to facilitate adaptation and adoption?

How to reduce the gap between demand and needs?

Summary



About Brazil

Agriculture in Brazil

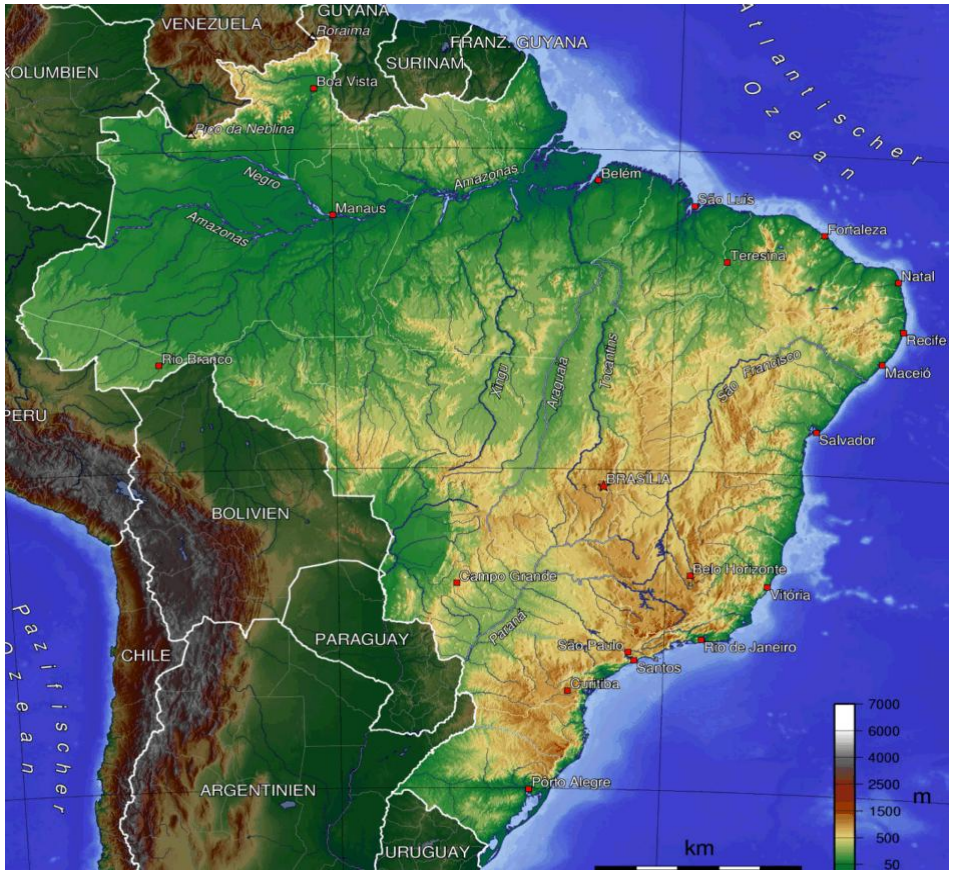
Drivers – Advanced Tropical Agriculture

Agricultural Innovation System in Brazil

Continuum R&D - TT - Communication

Final Messages

About Brazil



The largest economy in South America;

GDP: US$ 2,09 trillion (7th biggest economy);

Area: 8,514,000 km² (5th largest);

Population: 191.3 million (5th biggest population);

Brazil has since 1985 a stable democratic government;

10,000 Ph.D. graduate every year;

Rank 13th in scientific publications…

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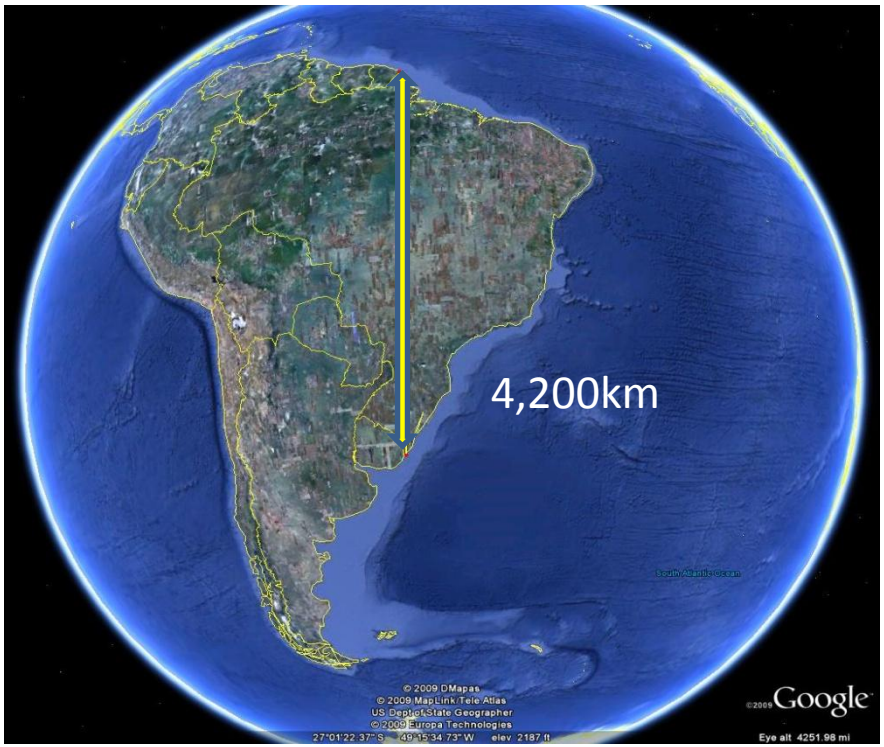
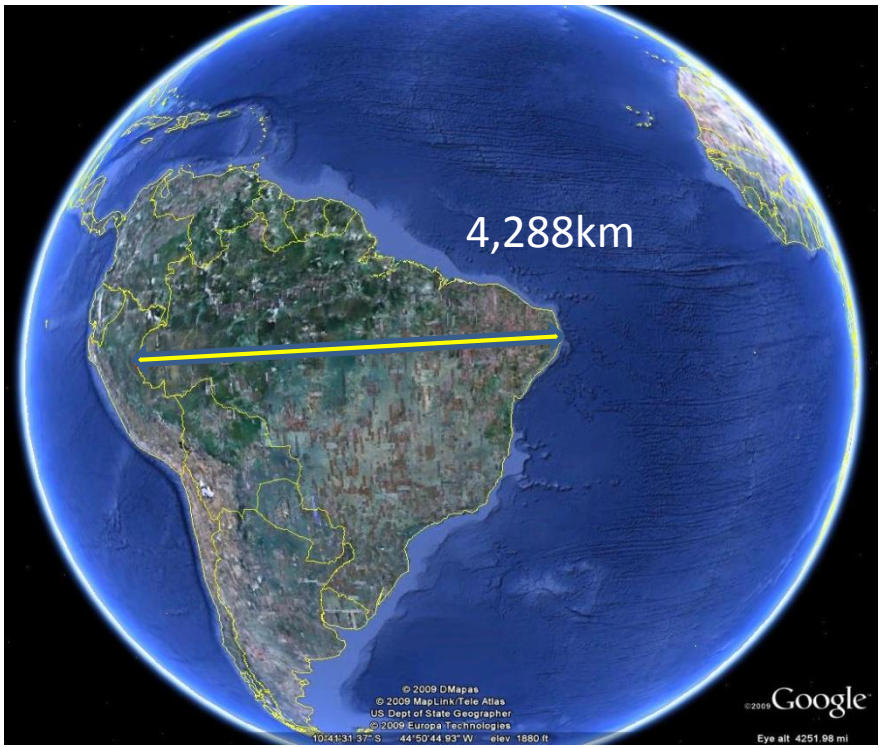
About Brazil

Great Environmental Diversity





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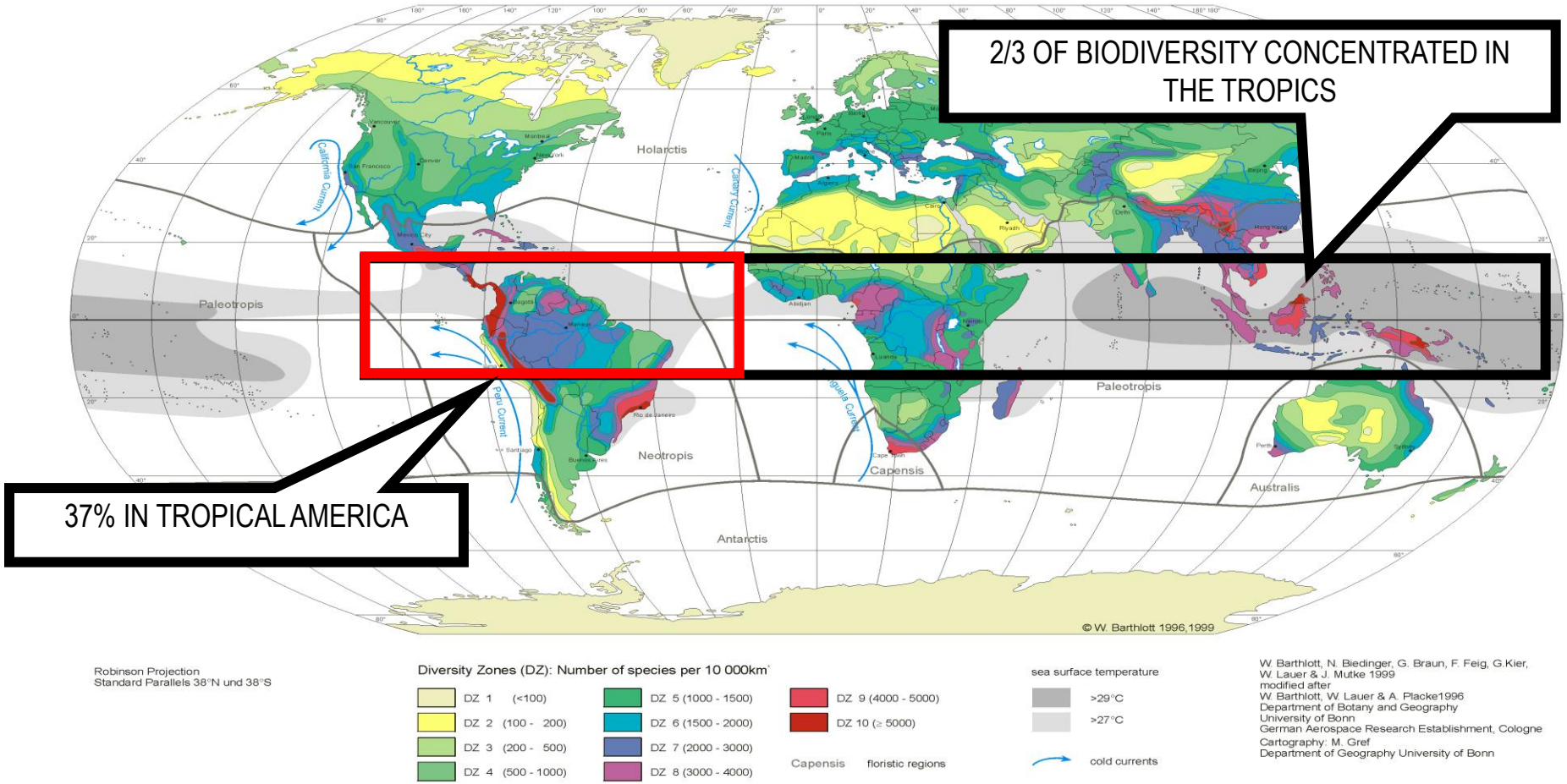
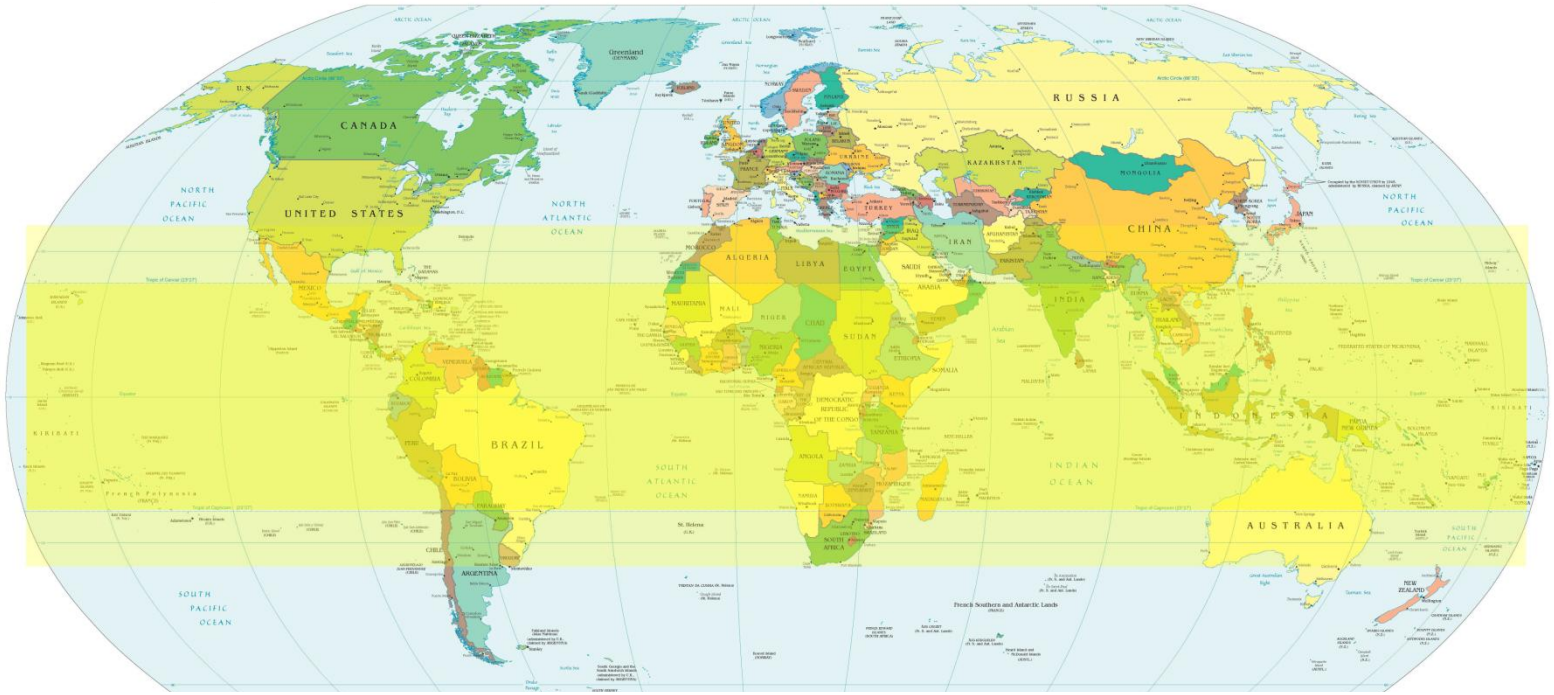
About Brazil

A Mega-diverse Country



Barthlott, W., Biedinger, N., Braun, G., Feig, F., Kier, G. & J. Mutke (1999): Terminological and methodological aspects of the mapping and analysis of global biodiversity. In: Acta Botanica Fennica 162: 103-110.

About Brazil



Most of the Brazilian Territory is Located in the Tropical Belt of the World

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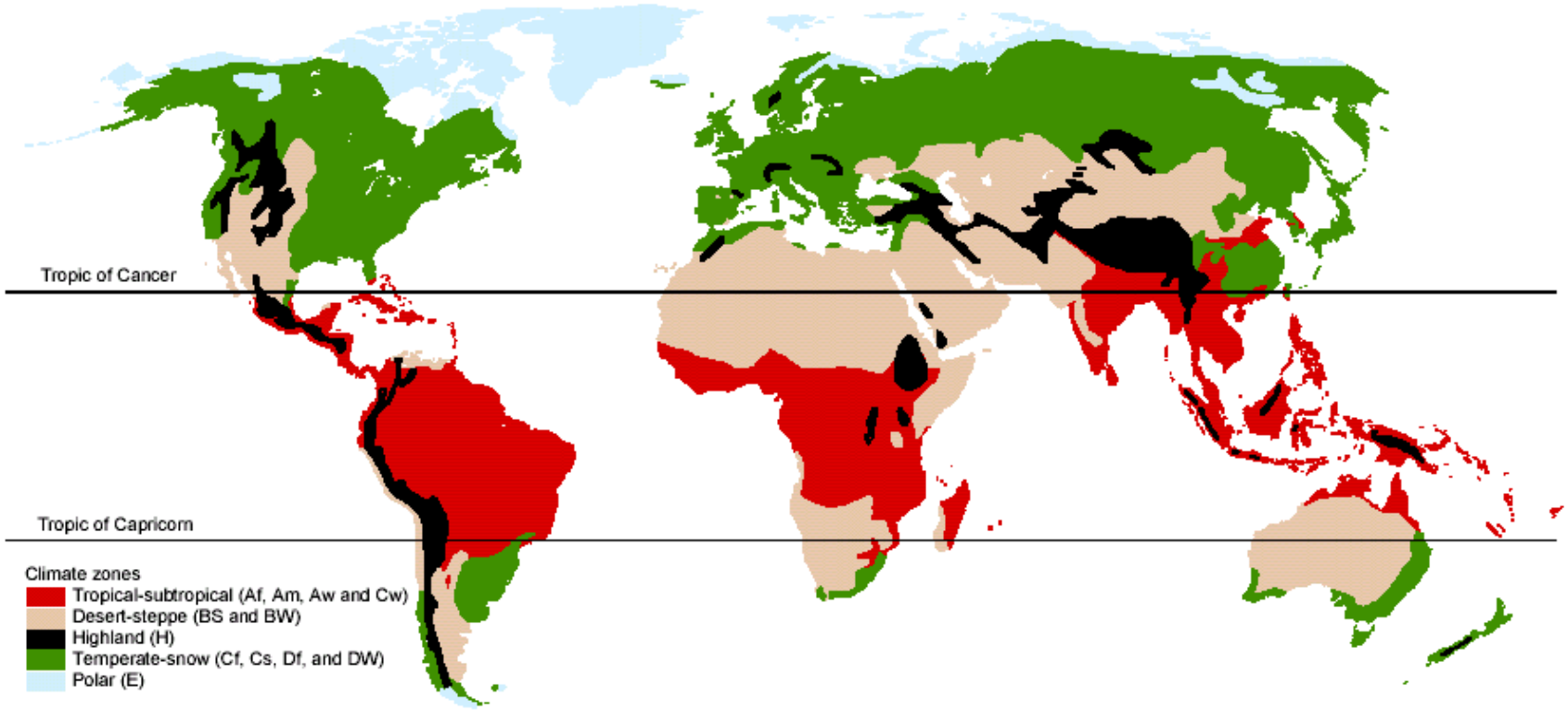
About Brazil



- Tropical zones are the most challenging to agriculture -

Intense biotic (pests) and abiotic (drought, soil acidity, low nutrients, etc) stresses.

All these challenges will be intensified with the global climatic changes.

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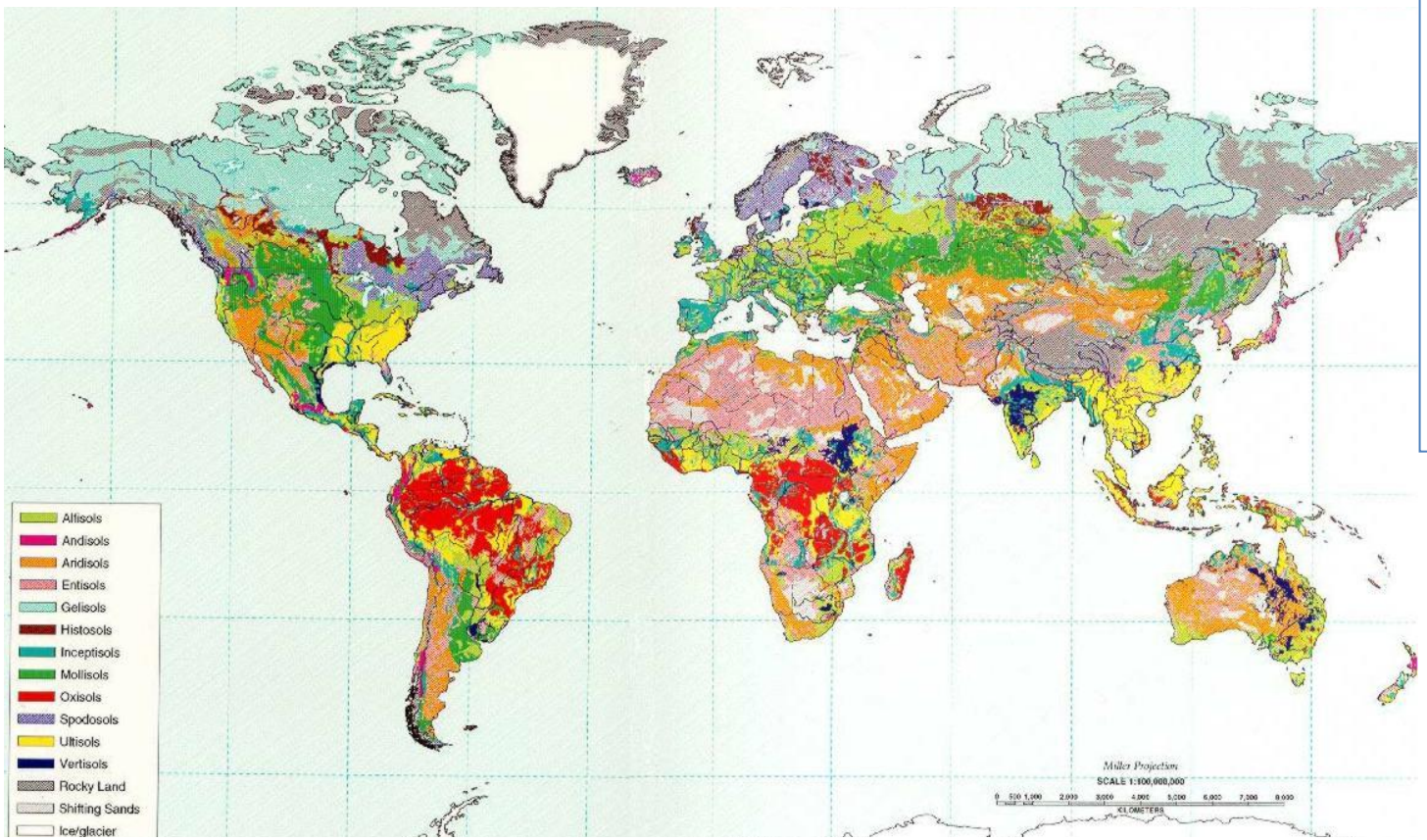
About Brazil

World Distribution of Soils



Tropical Soils

Acid – 84%

Saline – 2%

Shallow – 7%

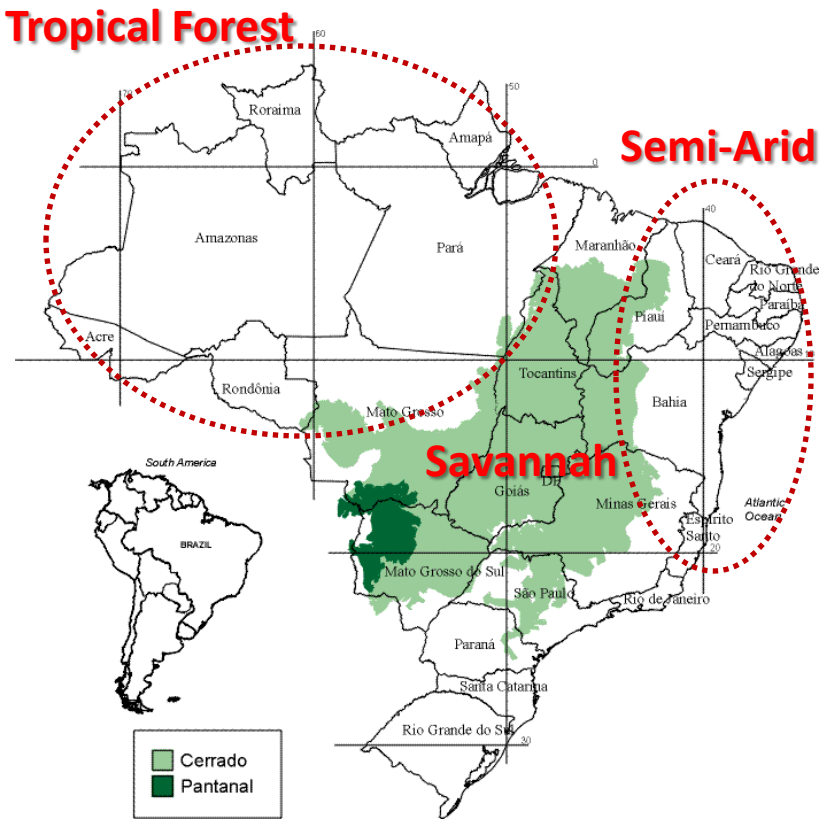
Flooded – 16%

No problem – 9%

Concentration of acidic and nutrient-poor soils in the tropics

http://www.nhq.nrcs.usda.gov/WSR/mapindx/metadata/Maps/ORDERS.JPG

Agriculture in Brazil before the 1970´s



Brazil was not a food secure country

- Low agricultural production and low yields;
- Production concentrated in the South and Southeast Regions;
- Constant food supply crisis and rural poverty;
- Lack of specific knowledge in Tropical Agriculture;
- Lack of adequate agricultural development policies.
- Brazil known as coffee and sugar producer.

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In 40 Years Brazil Developed an Advanced Tropical Agriculture Complex

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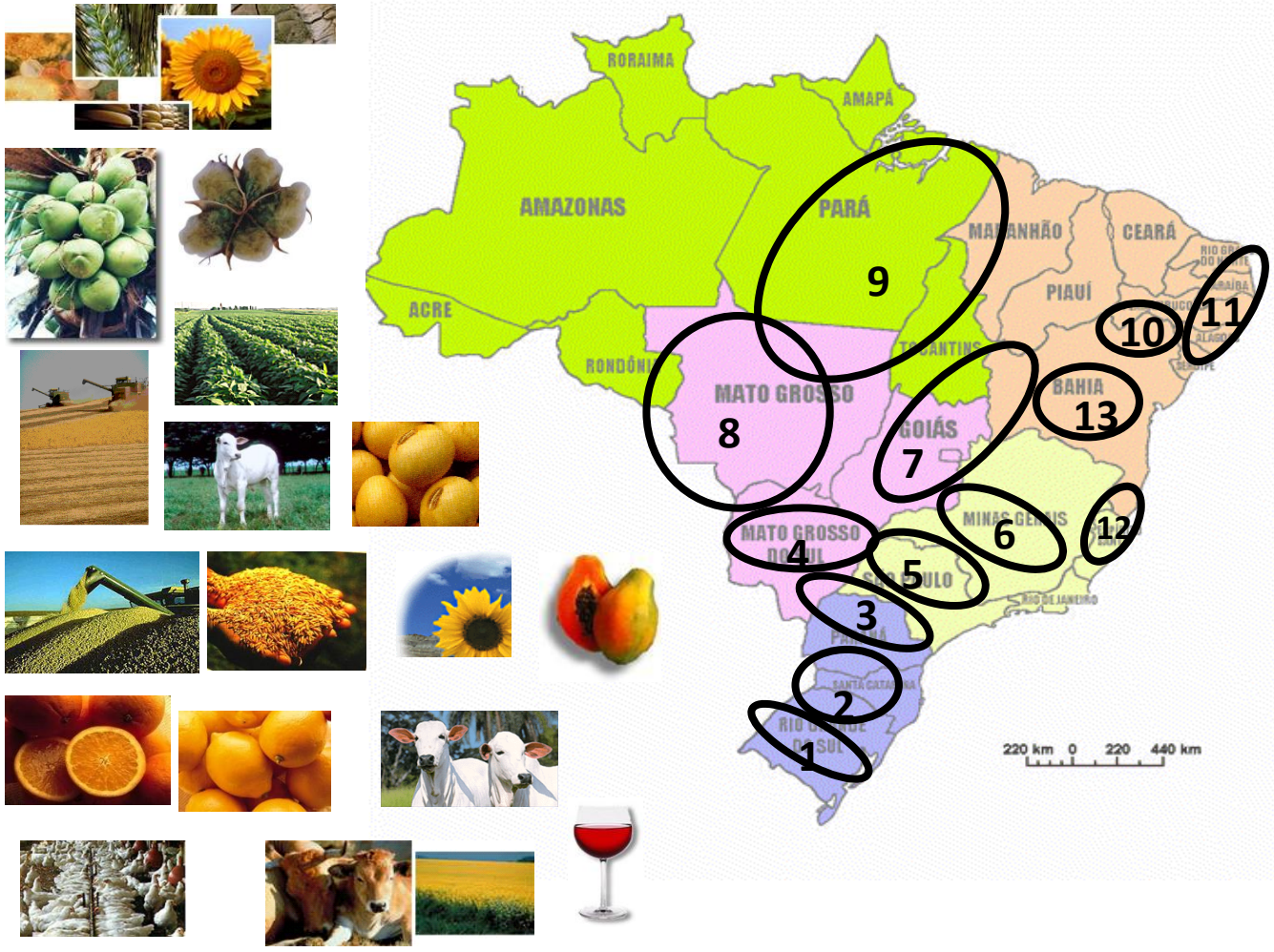
Agriculture in Brazil Today

Brazil became one of the largest agricultural producers in the world



AREA/ MAIN CROPS	MM HA
1- FLOODED RICE	0.95
2- SOYBEAN	3.30
CORN	1.30
WHEAT	0.60
3- SOYBEAN	3.20
CORN	2.40
WHEAT	0.90
4- SOYBEAN	1.20
PASTURE	11.00
5- SUGARCANE	2.50
COFFEE	0.30
CITRUS	0.70
6- COFFEE	1.00
7- SOYBEAN	1.80
CORN	0.80
COTTON	0.10
DRYBEANS	0.20
PASTURE	9.00
8- SOYBEAN	3.30
COTTON	0.50
CORN	0.40
PASTURE	12.00
9- PASTURE	10.00
10- TROPICAL FRUITS	0.07
11- SUGARCANE	0.90
12- COFFEE	0.60
13- DRYBEANS	0.70
SOYBEAN	0.90

Brazil Became an Important Food Exporter

2009 ranking: Brazilian Production and Exports

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

Sources: USDA, Ministry of Agriculture

Around 79% of the Brazilian food production is consumed domestically and 21% is shipped to over 180 foreign markets

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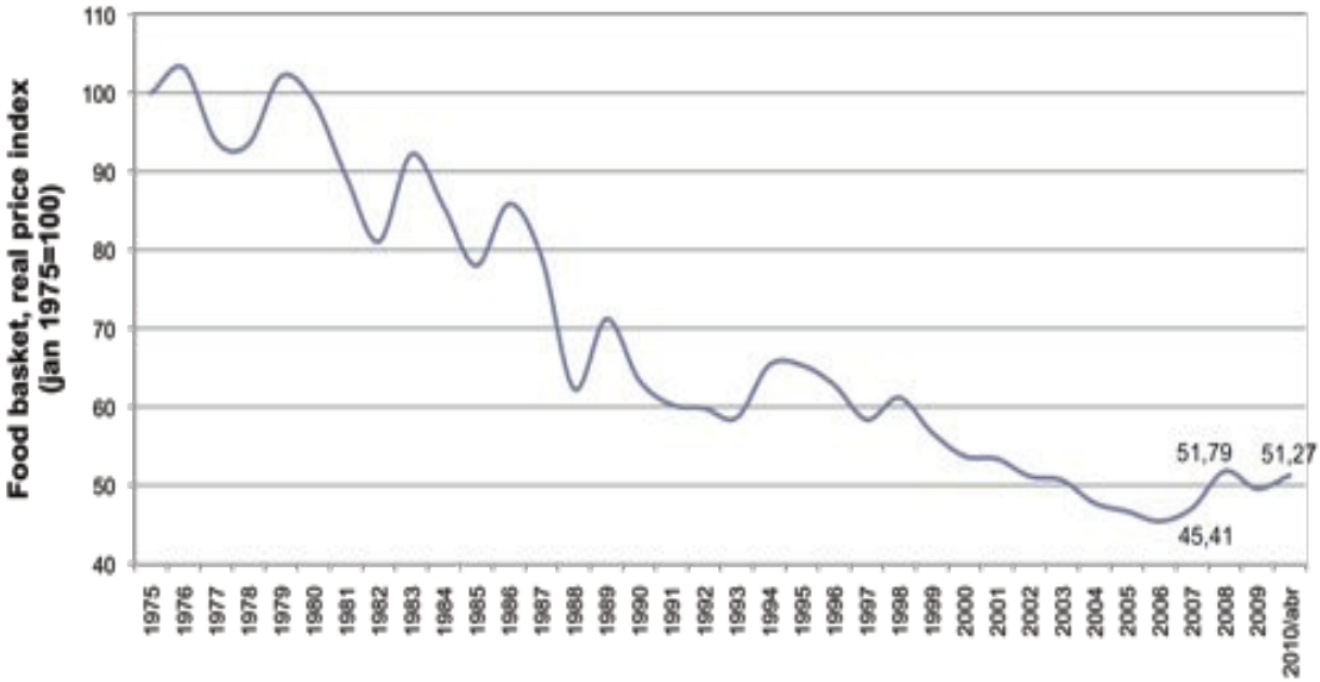
Source: MAPA, 2010

Brazil Became a Food Secure Country

Brazil Became Food Secure Country in a Short Period of Time

Embrapa
Estudos Estratégicos e Capacitação

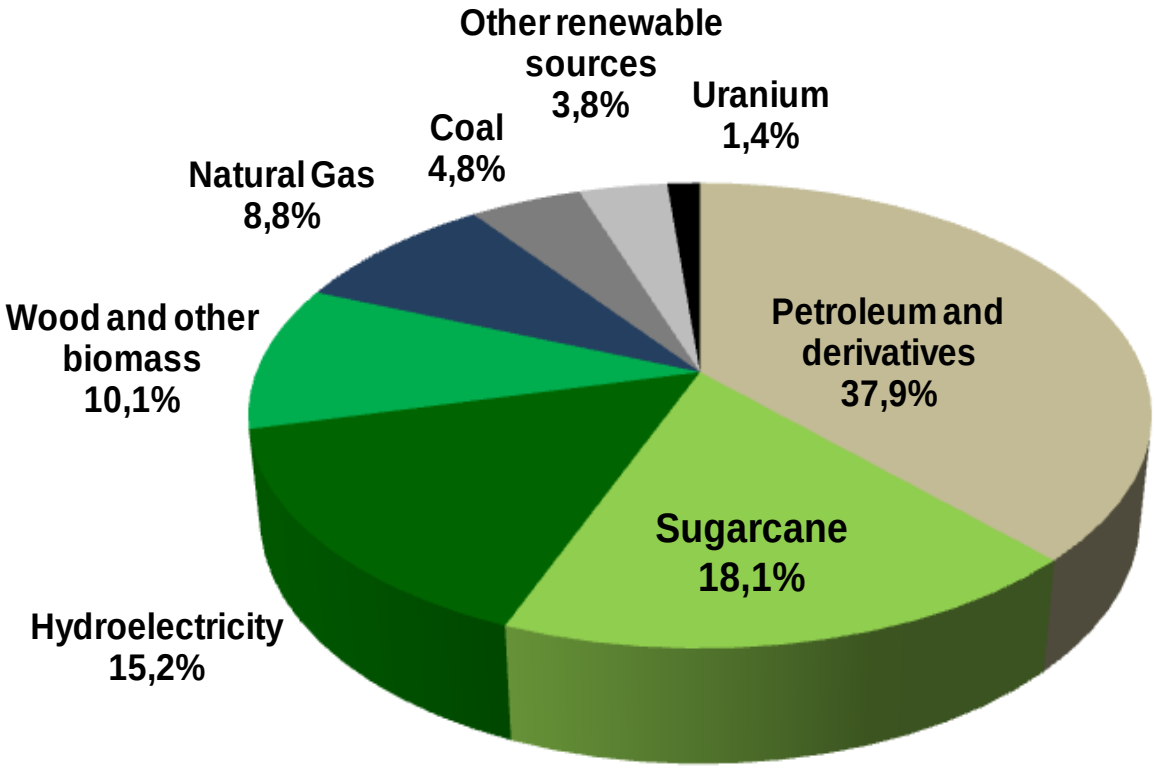
Food Basket: Real Prices, Jan/1975 – Apr/2010

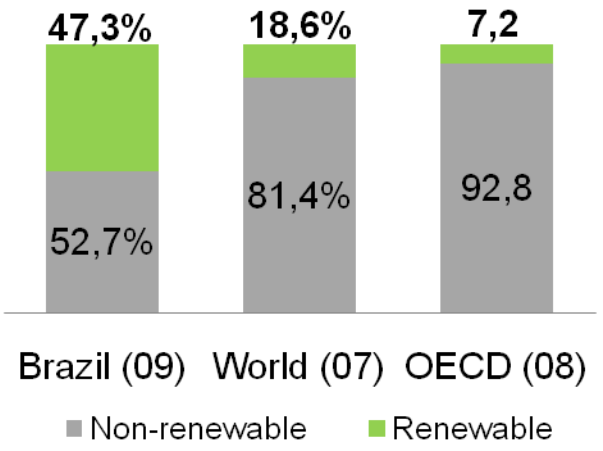


Source: Martha Jr., data from Dieese (2010)

Brazilian Agriculture: Food, Feed, Fiber and Fuel

Brazil Developed a Clean Energy Matrix





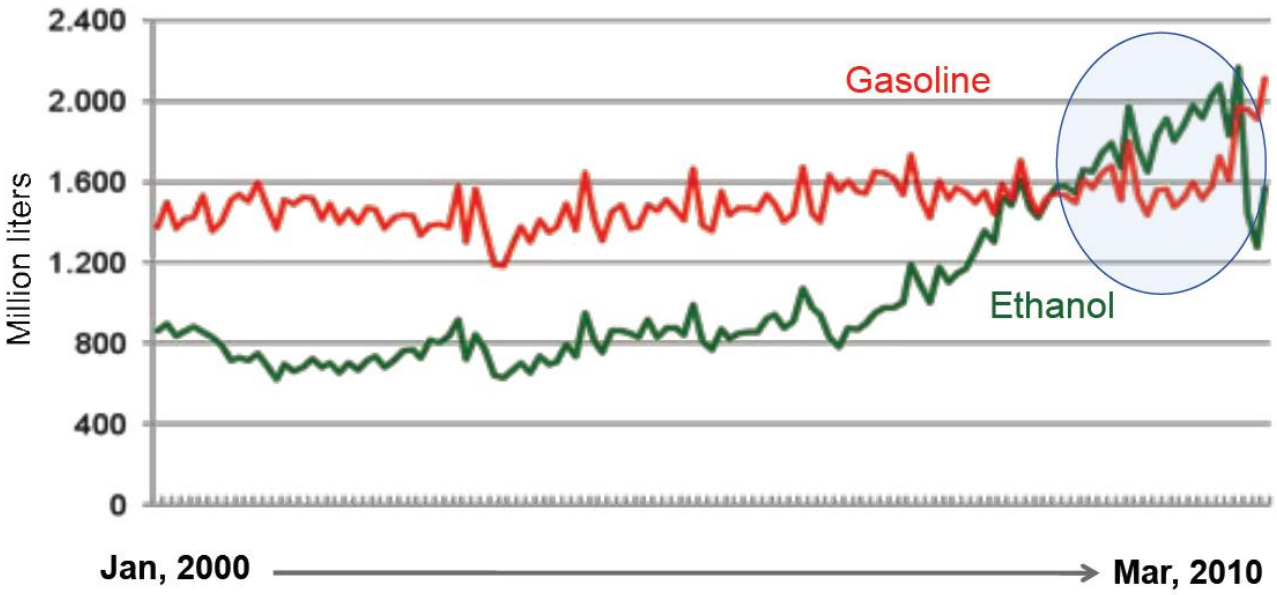
Source: BEN (2010). Elaboration: UNICA

Brazilian Agriculture: Food, Feed, Fiber and Fuel

'In Brazil, Gasoline is Becoming the Alternative Fuel'

Embrapa Estudos Estratégicos e Capacitação

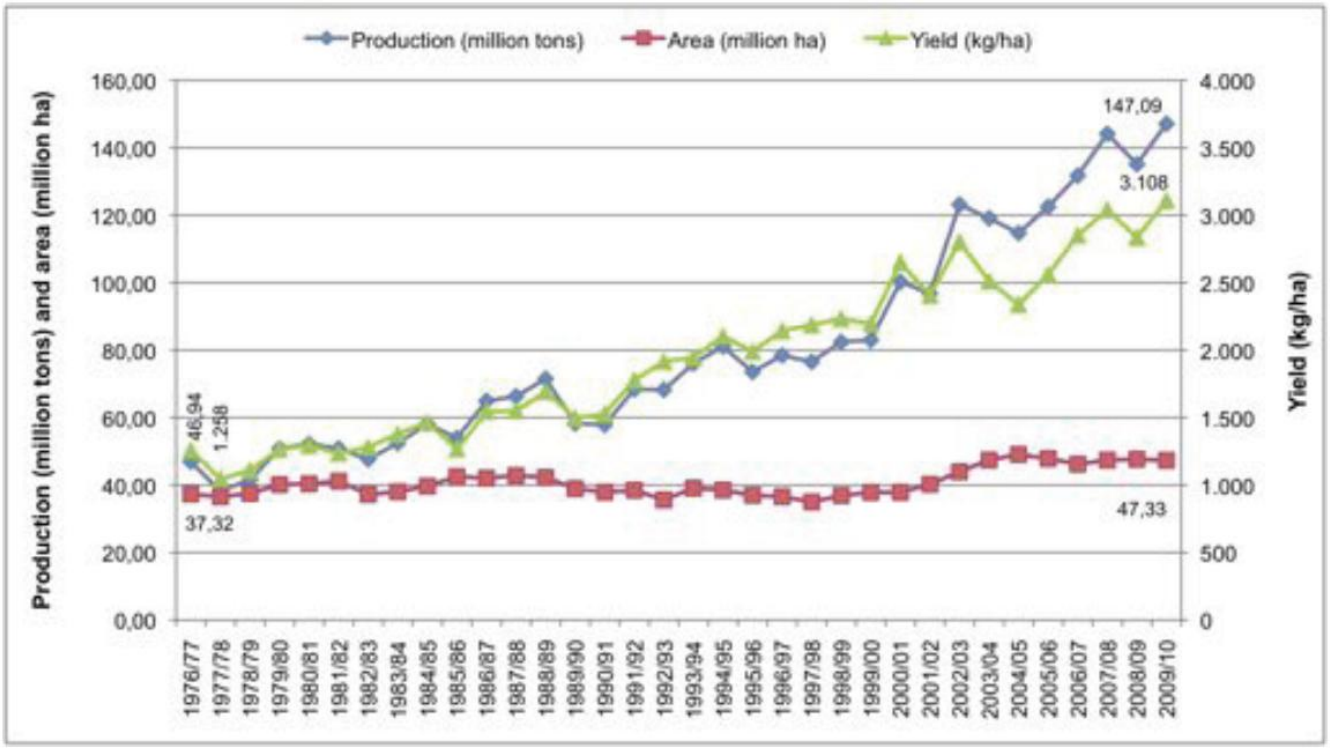
Consumption of Gasoline and Ethanol in Brazil



Source: ANP. Elaboration: UNICA.

Agricultural Intensification x Agricultural Expansion

Evolution of grains and oilseeds production (million metric tons), yields (Kg/ha) and area (million hectares) in Brazil from 1975 to 2010.



Source: Contini and Martha Jr., data from CONAB (2010)

Conservation Agriculture in Brazil

Drastic reduction in soil erosion – improved chemical, physical and biological properties
Reduction in energy use - Agriculture is becoming a major “producer” of clean water

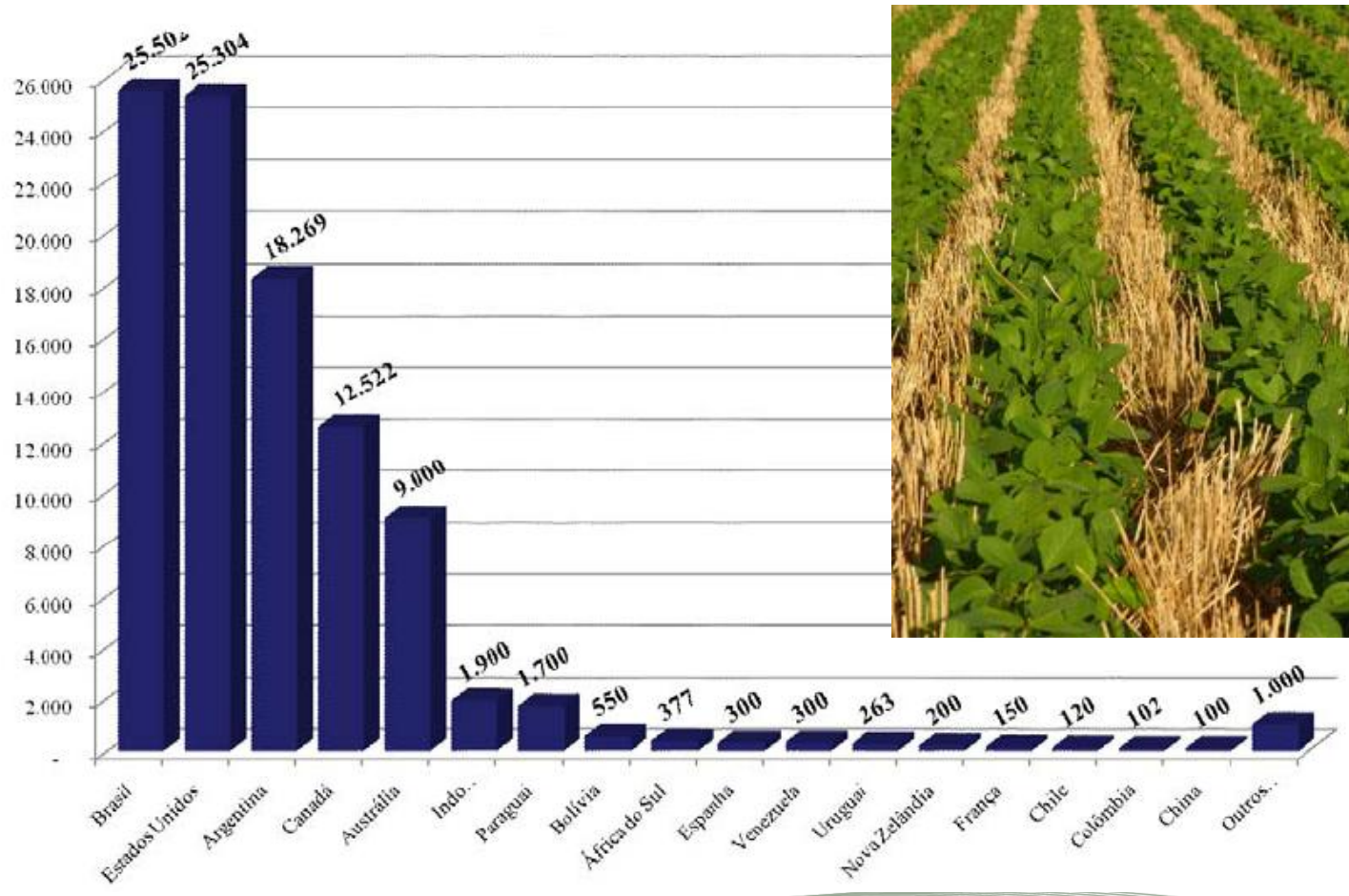




Source: Modified from Oliveira and Trecenti, 2009 – http://tinyurl.com/26ay4cm

Conservation Agriculture in Brazil

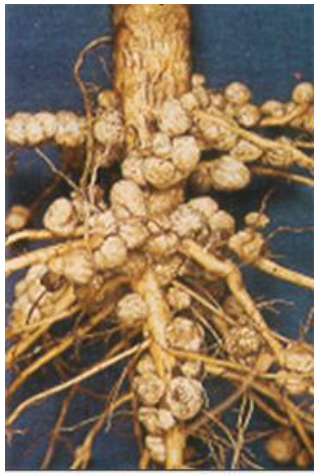
Cultivated area under no-tillage systems around the world (1000 ha)



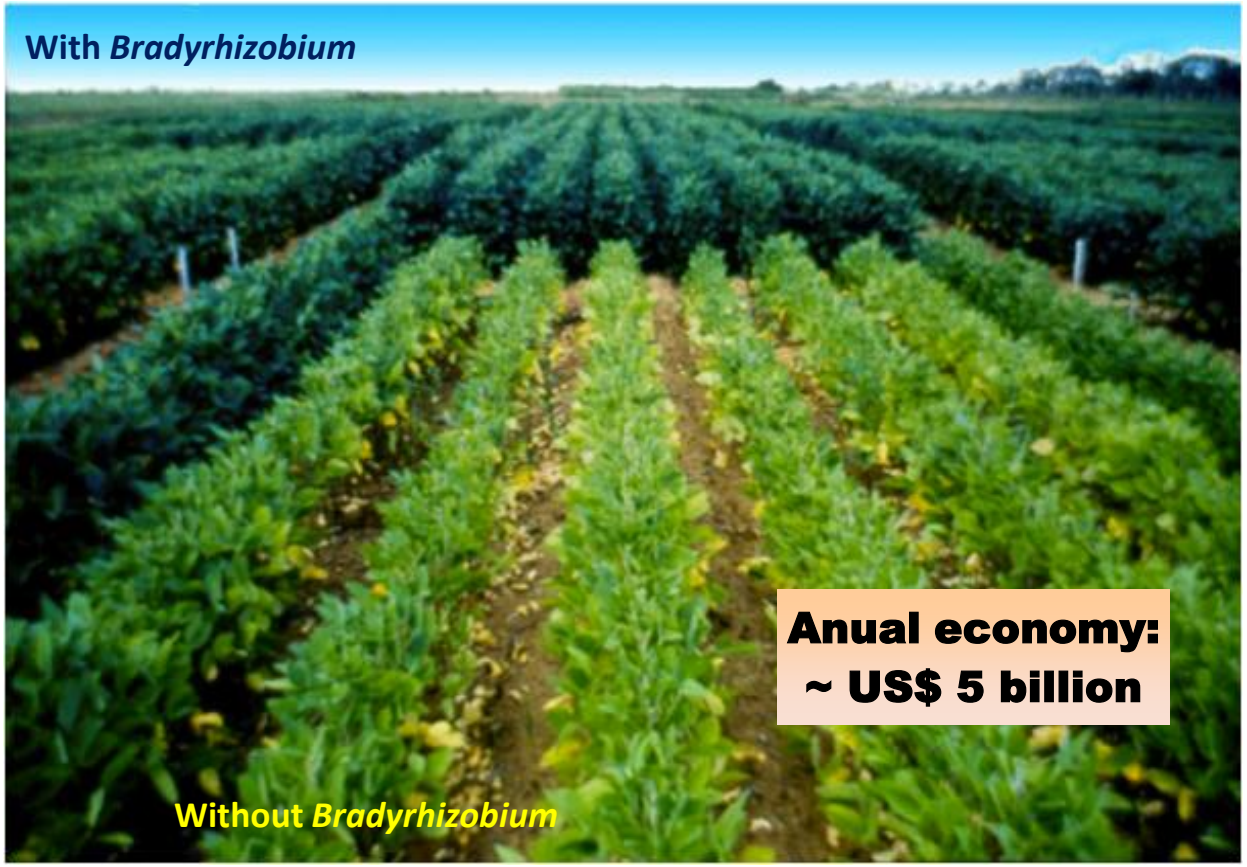
Source: Federação Brasileira de Plantio Direto na Palha – FEBRAPDP, 2006

Biological Nitrogen Fixation

Brazil has become the world leader in replacing N fertilizers by biological N_2 fixation (BNF).



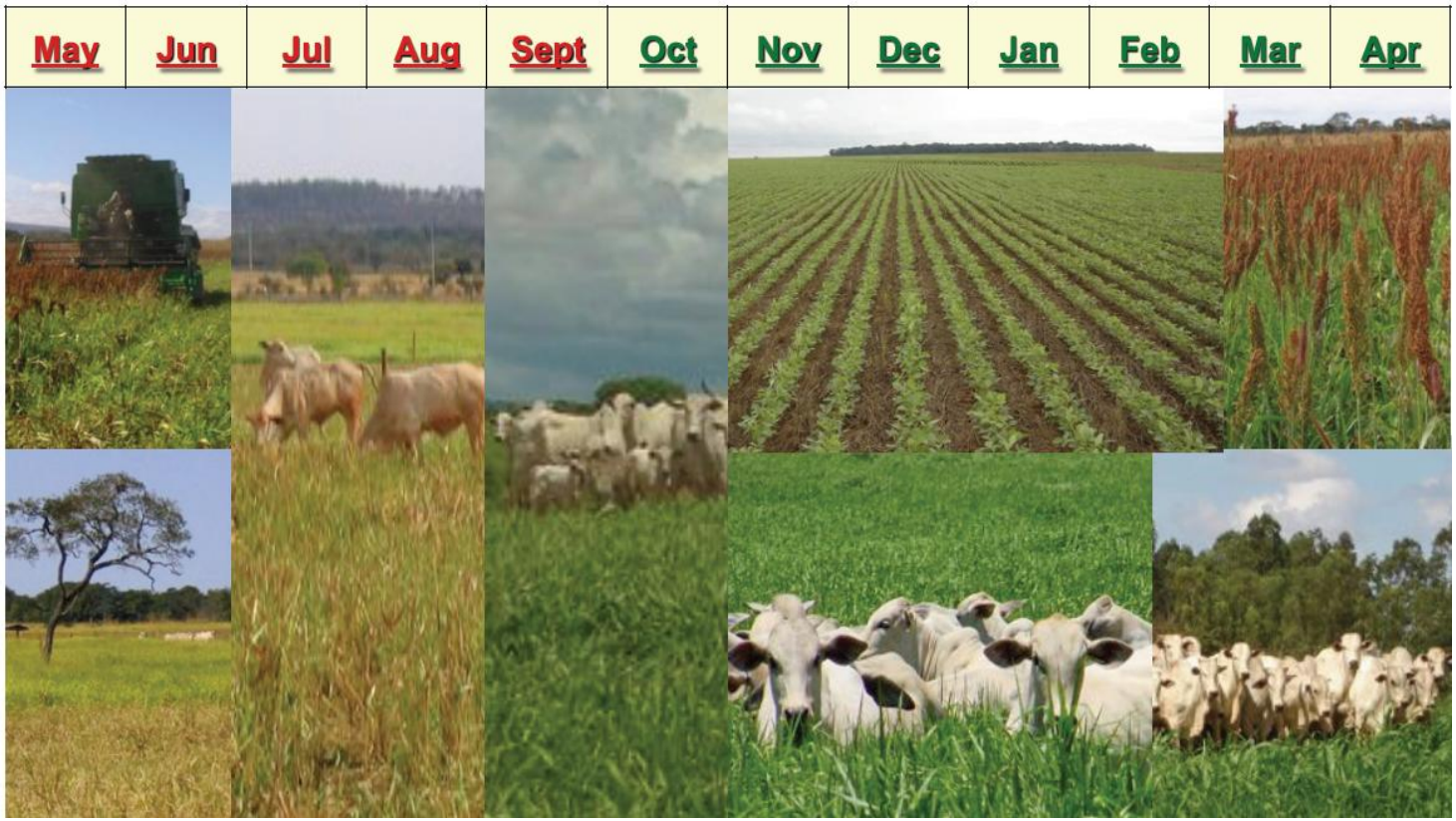
Nitrogen fixation occurs in nodules on legume roots (Source: FAO, Rome)



Source: Contini and Martha Jr., 2010

Agricultural Intensification x Agricultural Expansion

Integrated Crop-Livestock Systems



Source: Contini and Martha Jr., 2010

Agricultural Intensification x Agricultural Expansion

Intensification of land use with integrated crop-livestock-forest systems
Large Scale Operations

Source: MAPA, 2010 – Photos by Votorantin Metais

Agricultural Intensification x Agricultural Expansion

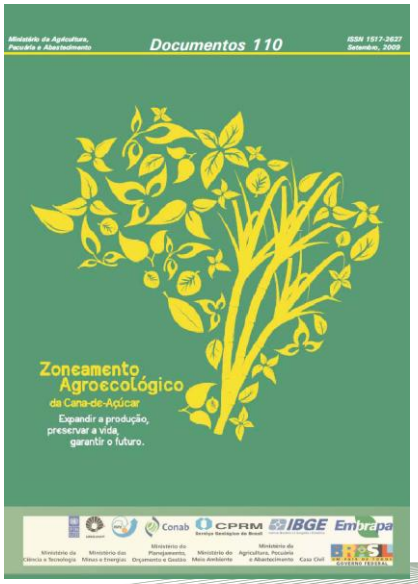
Intensification of land use with integrated crop-livestock-forest systems
Technologies Adapted to Small Scale Farming Systems

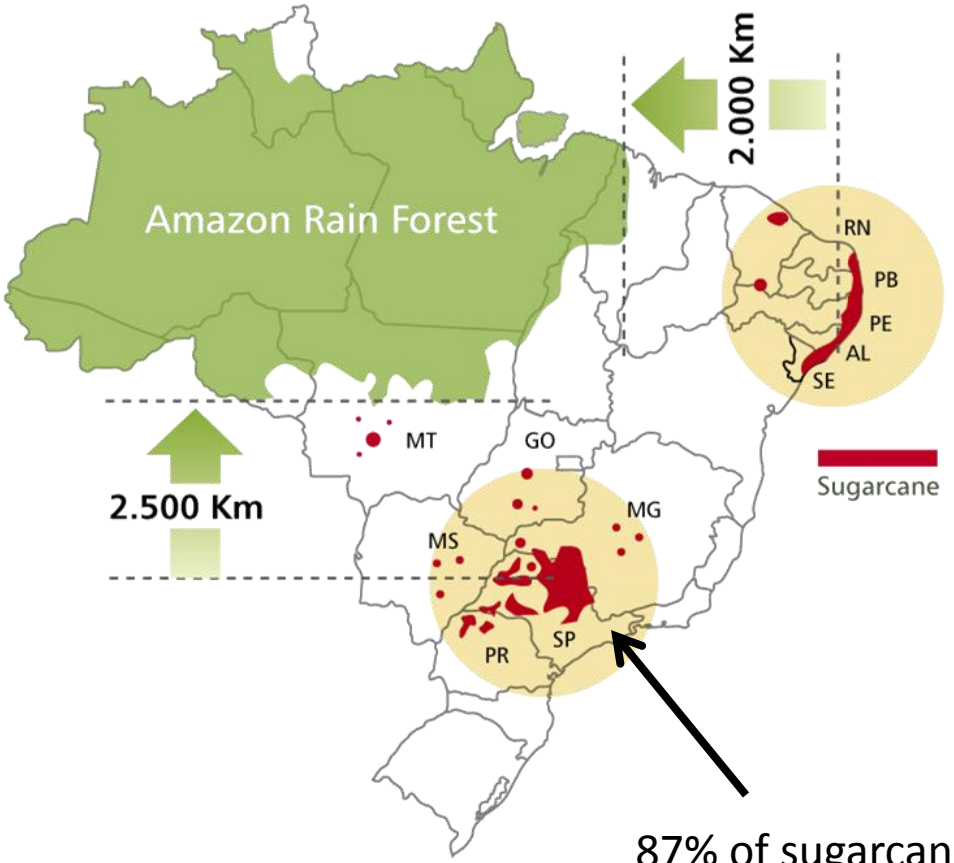
Source: MAPA, 2010 – Photo by APDC

Agroecological Zoning Plan for Sugarcane Expansion

Brazil is using Zoning Technology to Manage Sugarcane Expansion

Sugarcane for ethanol production occupies 1.5% of Brazil´s arable land





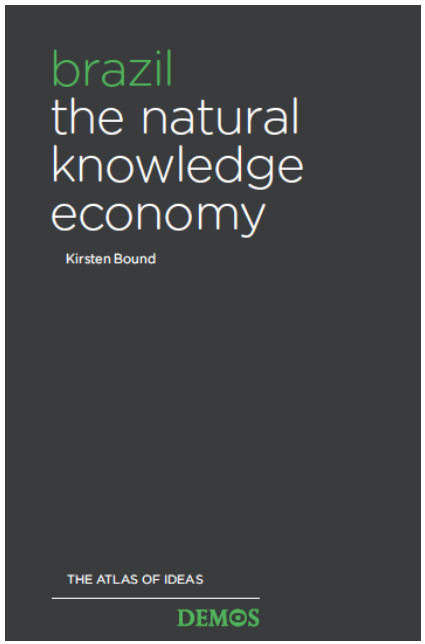
87% of sugarcane production

http://www.cnps.embrapa.br/zoneamento_cana_de_acucar/ZonCana.pdf

Source: UNICA.

Always Moving Towards Sustainability

Source: MMA/Brazil



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."

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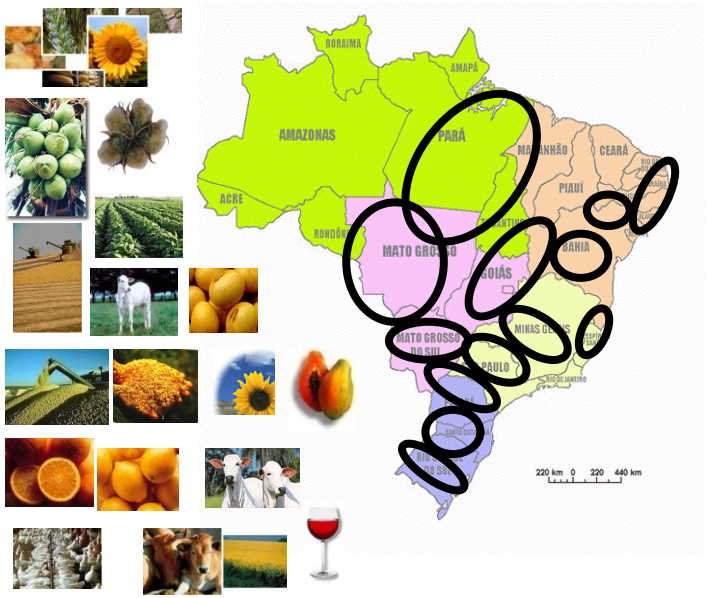
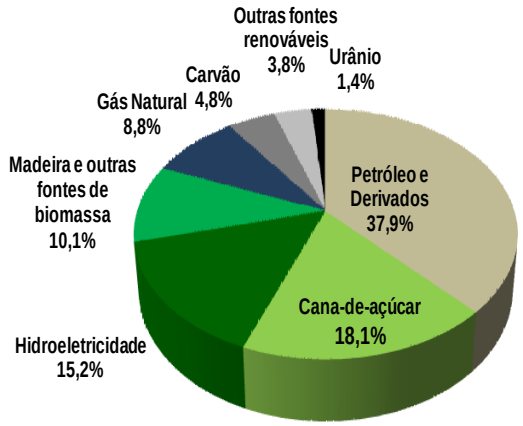
Always Moving Towards Sustainability

Brazil – Agriculture



Brazil – Environment

Brazil – Sustainable Energy



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Key Drivers for Development of Advanced Tropical Agriculture in Brazil

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Development of Tropical Agriculture in Brazil

Key drivers of Agricultural Development in Brazil

Government commitment and public policies

Development of science-based tropical agriculture

Availability of basic infrastructure

Large extension of arable land and adequate climatic conditions

Landscape suitable for mechanization

Good physical characteristics of the soils

Availability of mineral resources (limestone and phosphate)

Entrepreneurship of farmers

Development of Tropical Agriculture in Brazil

Key drivers of Agricultural Development in Brazil

Government commitment and public policies

AG Research, Technology Transfer and Education

Credit:
Technology (seeds, fertilizers, agrochemicals, machinery, equipments)

Market Development:
Minimum prices
Food regulatory stocks
Risk Insurance
Infra-structure: roads, storage facilities, etc.

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Institutional Building and Strengthening

Creation of a Comprehensive Agricultural Research & TT System

17 State Research Networks
OEPAS

CONSEPA
Conselho Nacional dos Sistemas Estaduais de Pesquisa Agropecuária

70 Agricultural Universities

The Brazilian Agricultural Research Corporation
47 Embrapa Centers

Private Sector

Brazil has also an active and growing private sector, which supplies technologies and technical assistance mainly in farm inputs and food processing

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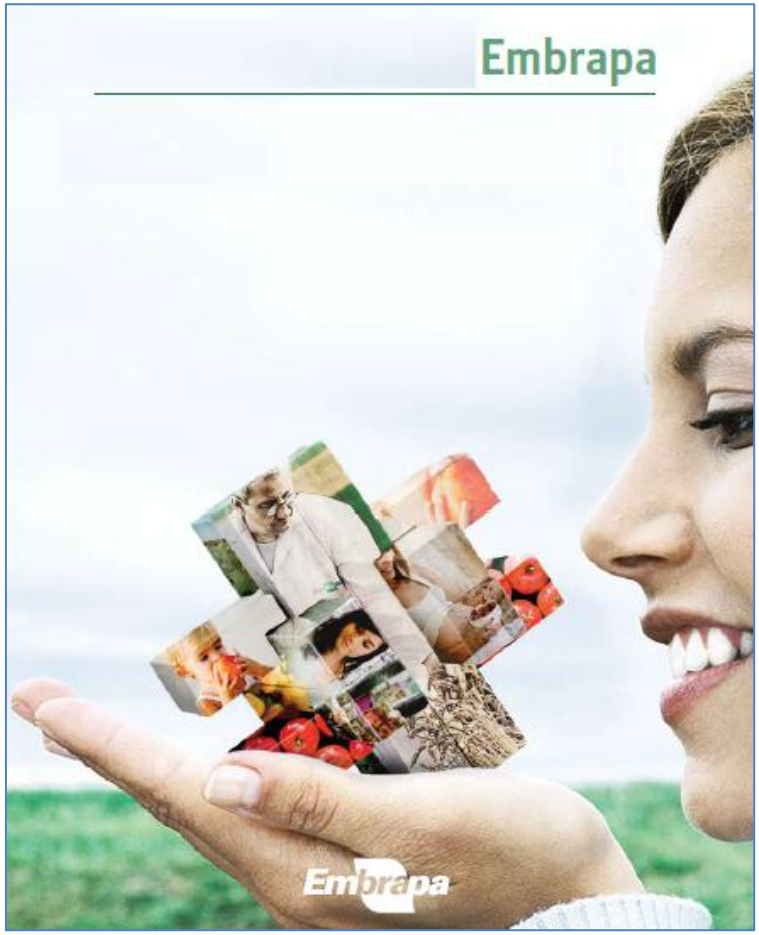
The Brazilian Agricultural Research Organization

Creation of the Largest Agricultural R&D Organization in Latin America



Embrapa is the largest component of the Brazilian Agricultural Research System and…

The largest agricultural R&D agency in Latin America in terms of both staff numbers and expenditure.

Embrapa is headquartered in the capital Brasilia and operates 47 research centers throughout the country.

The Brazilian Agricultural Research Organization

Creation of the Largest Agricultural R&D Organization in Latin America

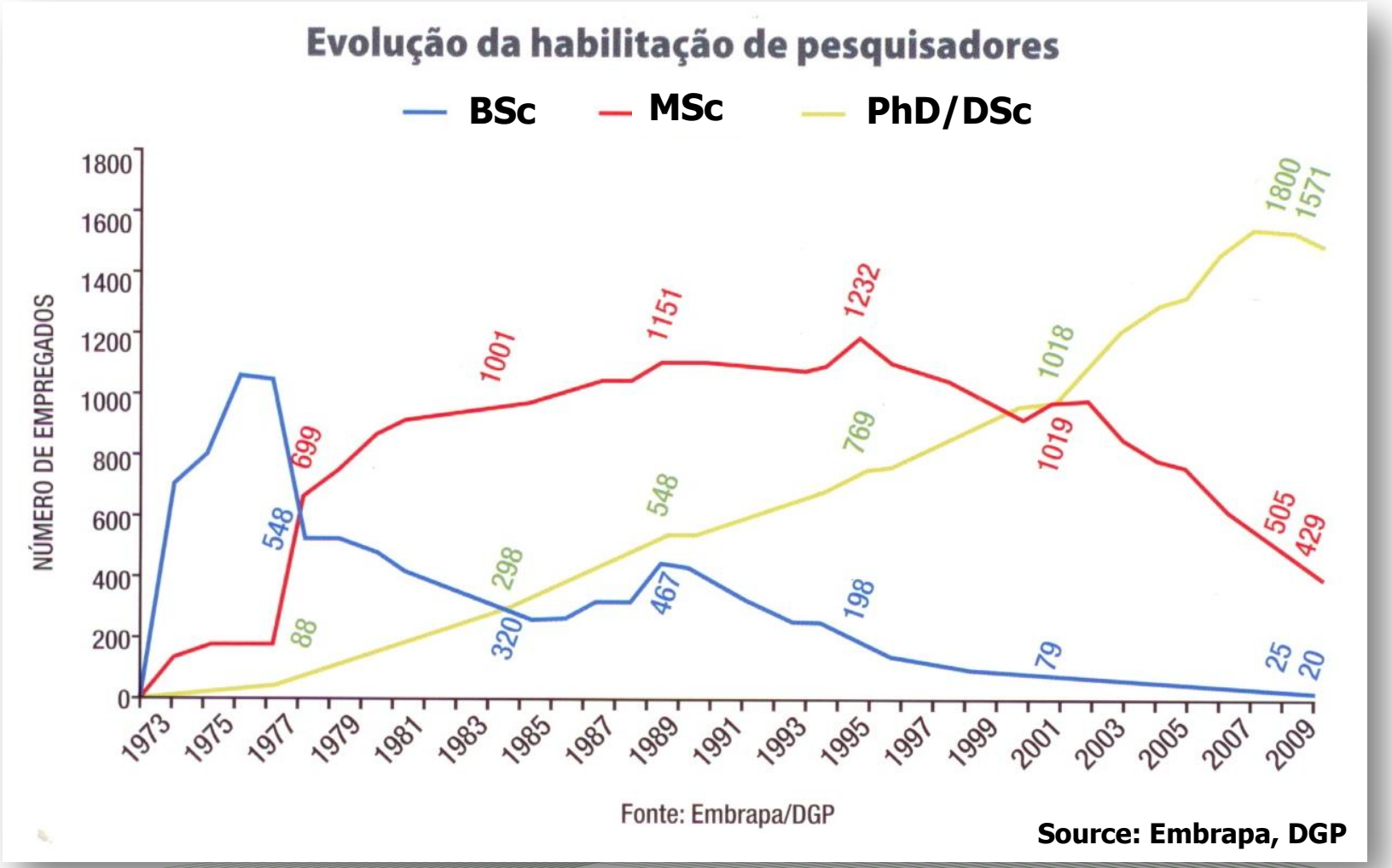
Established in 1973
Employees: 9,284
Budget: Over US$ 1 billion

47 Centers and Services

- 15 National Thematic Centers
- 16 National Product Centers
- 16 Ecorregional/Agroforestry Centers

The Brazilian Agricultural Research Organization

Long Term Commitment to Capacity Building and Human Development

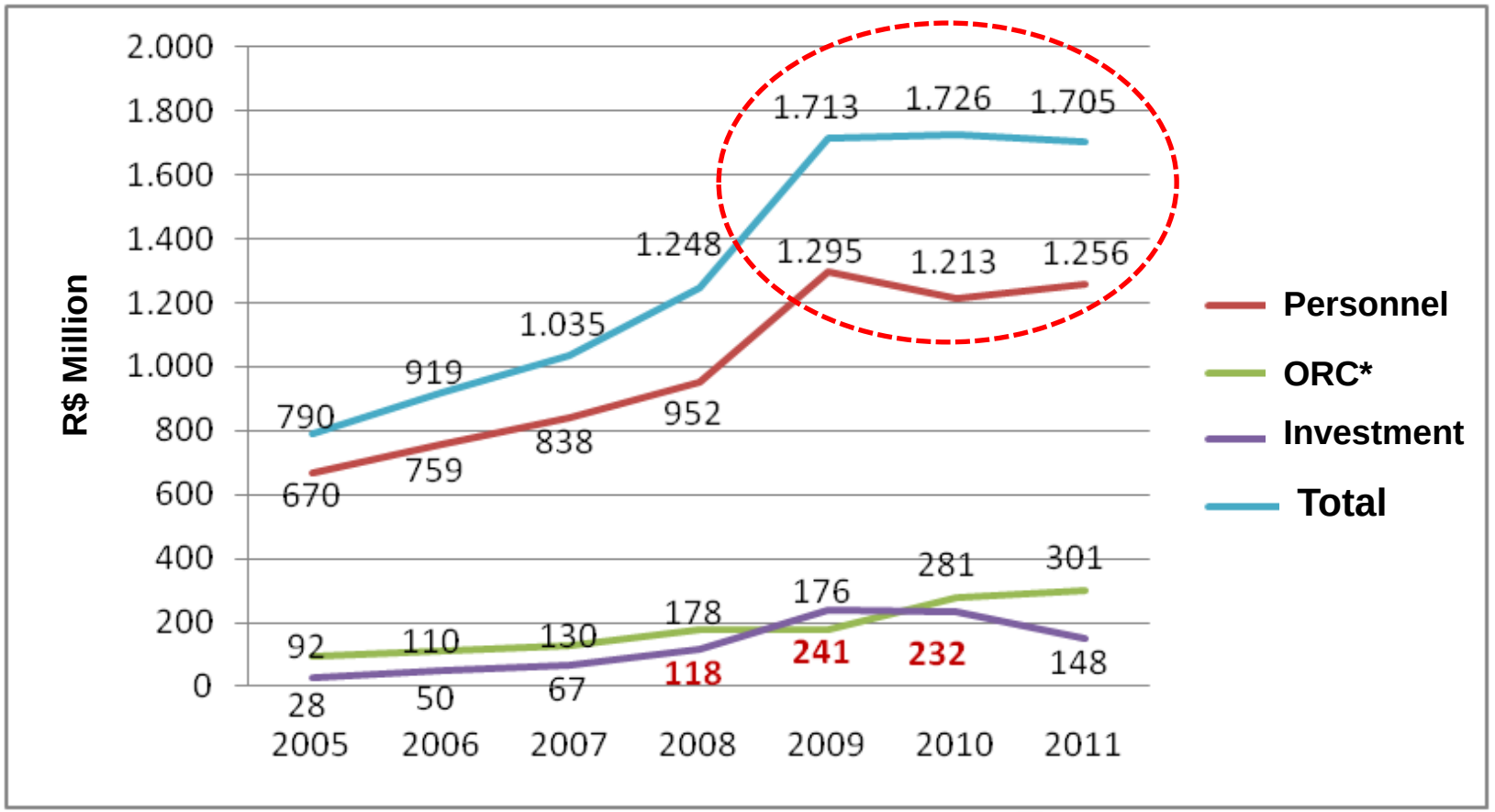


Source: Embrapa, DGP

The Brazilian Agricultural Research Organization

Continuous Government Support – Budget Allocations

Embrapa's Budget Evolution



*ORC – Other Recurrent Costs

The Brazilian Agricultural Research Organization

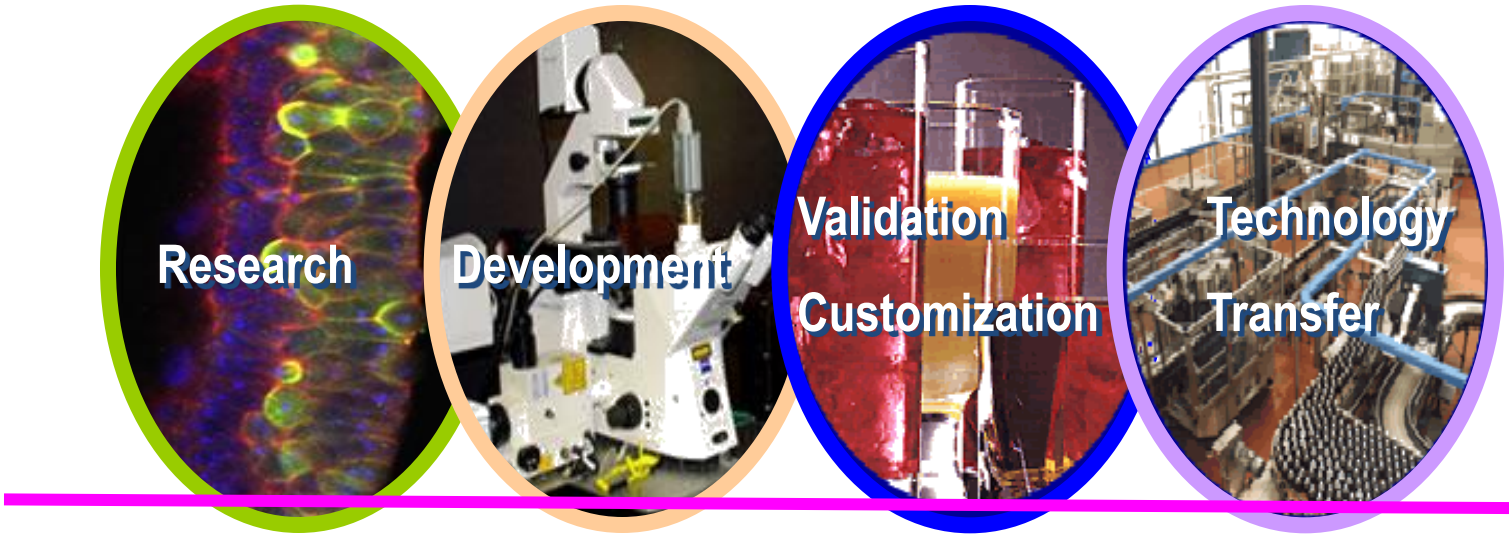
Continuous Improvement of Infrastructure

R&D and Technology Transfer Strategy

Embrapa

From Problems/Opportunities to Solutions

Embrapa´s Management Strategy



R&D	R&D	**R&D**	R&D
TT	TT	TT	**TT**
Comun.	Comun.	Comun..	**Comun.**

Embrapa Innovation – A Comprehensive Portfolio

Products

- Inbred Lines
- Varieties
- Hybrids
- Germplasm
- Bioinsecticides
- OGMs
- Agricultural Machinery
- Equipaments
- Kits for diagnostics
- Vaccines

Information

- Cultivar Evaluation Networks
- Traceability and Certification
- Forecasting and Future Analysis
- Biological Security Networks
- Gene and Biological Function
- System´s Automation
- Monitoring – IPM
- Monitoring – Environmental Quality
- Monitoring – Food Chains
- OGMs & Biosafety

Processes

- Crop Management Systems
- Crop Adaptation Processes
- Food Processing Methodology
- Plant & Animal Transformation
- Gene Prospection Methodology
- Integrated Pest Management
- Fingerprinting
- Agroecological Zoning
- Traceability & Certification

Services

- Germplasm Exchange
- Quarentine Analysis
- Information Networks
- Franchising
- Quality Control
- Consultancy
- Training
- Business Incubation

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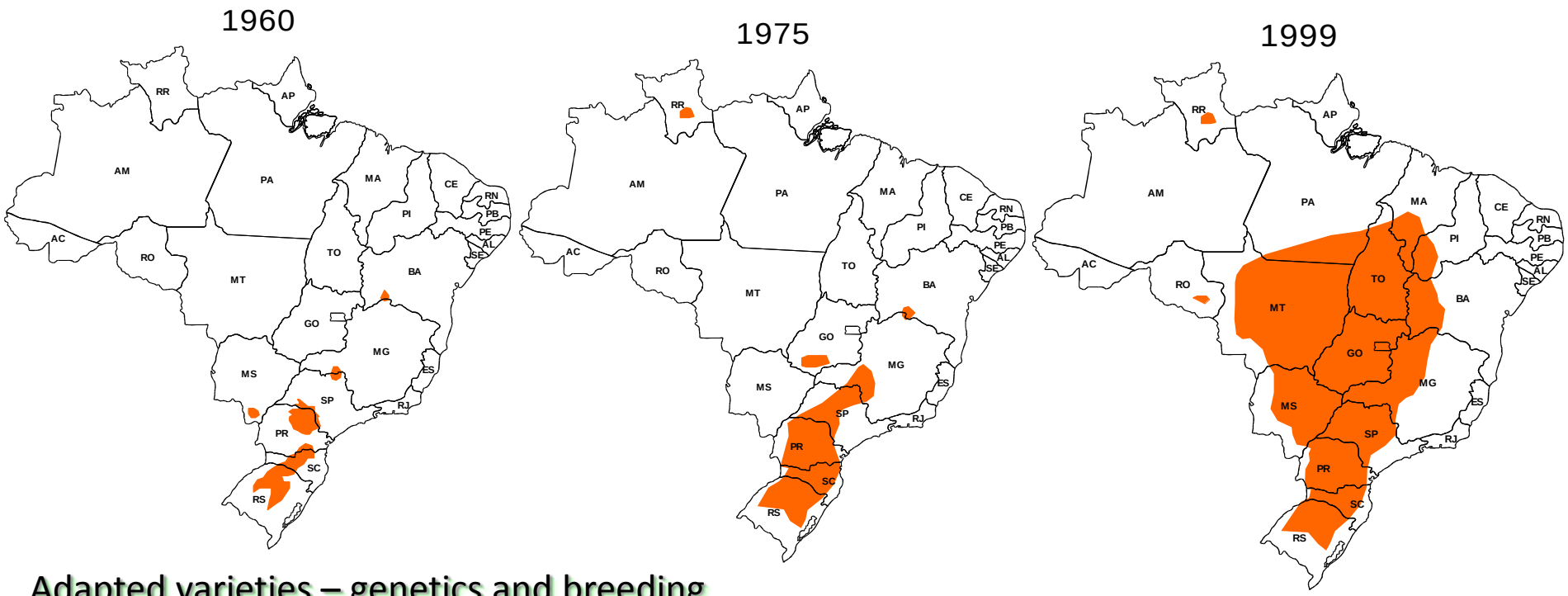
Development of Tropical Agriculture in Brazil

Brazilian Scientists had to “Tropicalize” soybeans



Adapted varieties – genetics and breeding

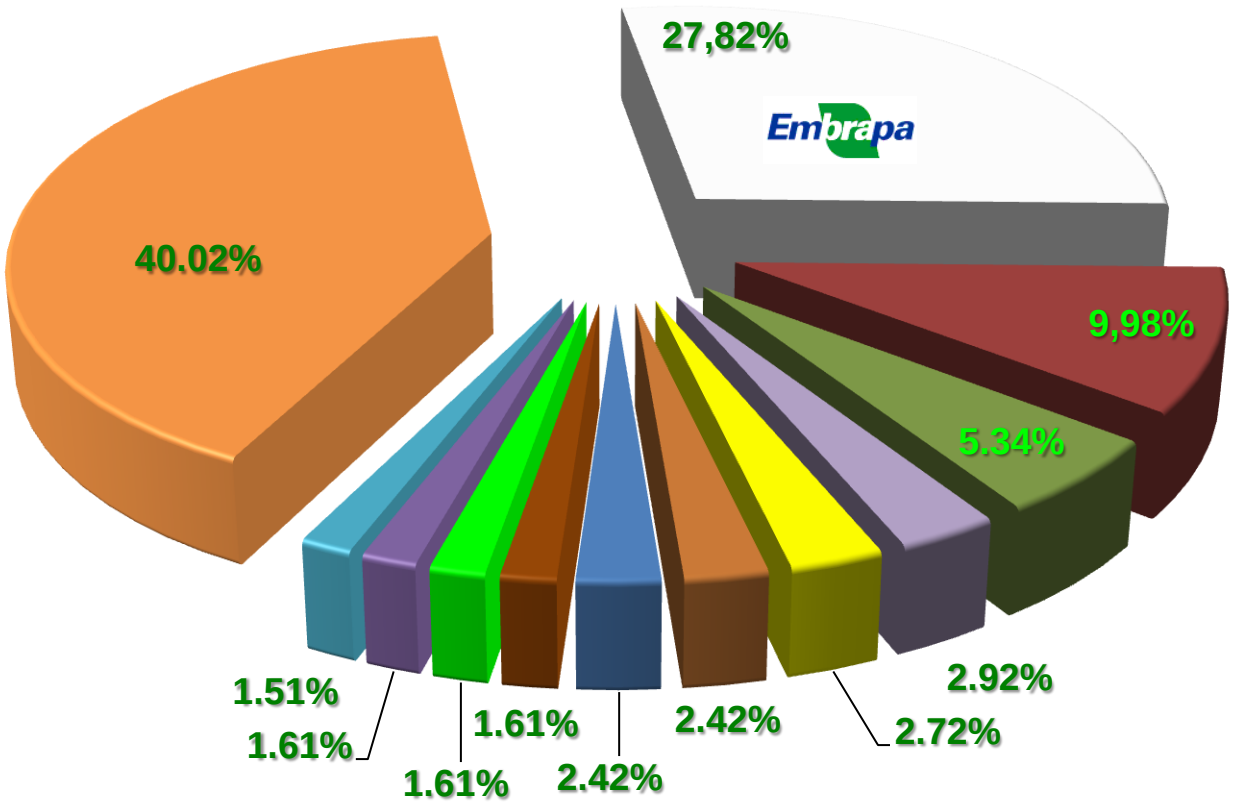
Biological nitrogen fixation

Minimum tillage - mechanization

Source: Embrapa Soybean

Technology Transfer and Innovation Flows

Protected varieties: 992 (2010)



Technology Transfer and Innovation Flows

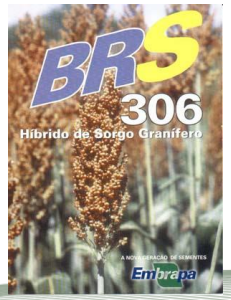
Technology Transfer Centers

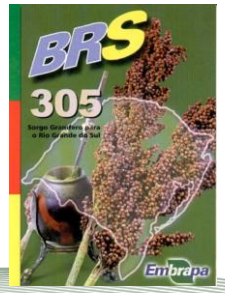
Embrapa Technology Transfer Centers

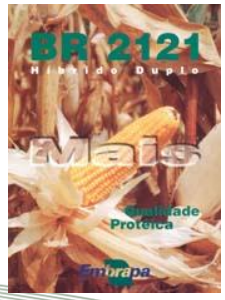
EN da Amazônia
EN de Campina Grande
EN de Campinas
EN de Canoinhas
EN do Capão do Leão
EN de Dourados
EN de Goiânia
EN de Imperatriz
EN de Londrina
EN de Passo Fundo
EN de Petrolina
EN de Ponta Grossa
EN de Sete Lagoas
EN do Triângulo Mineiro

Technology Transfer and Innovation Flows

UNIMILHO – Franchising in Genetics







Embrapa

Developing New, Cutting-Edge Tecnologies - PPPs

BASF and Embrapa's Cultivance®soybeans receive approval for commercial cultivation in Brazil

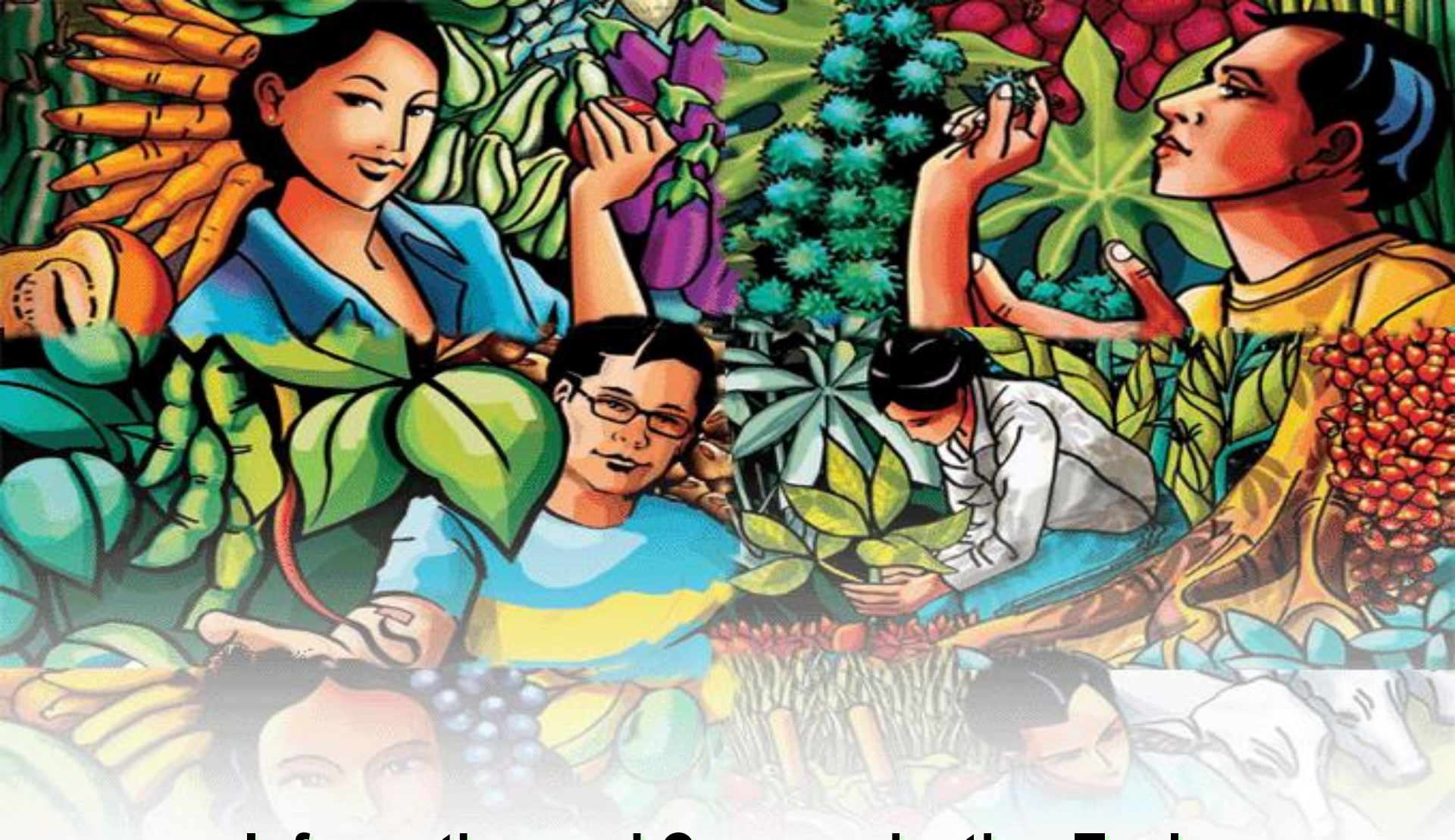
2010-02-05
P-10-148

- First genetically modified crop developed in Brazil to reach commercialization stage
- Market launch to take place after regulatory approval in key export markets

BASF and Embrapa's Cultivance® soybeans receive approval for commercial cultivation in Brazil

Cultivance® is the first genetically modified crop developed in Brazil, from laboratory to commercialization. The approval is the result of more than 10 years of successful cooperation between Embrapa and BASF, a global leader in providing agricultural solutions. The Cultivance® Production System combines herbicide-tolerant soybean varieties with BASF's broad spectrum imidazolinone class of herbicides, tailored to regional conditions. Photo: BASF - The Chemical Company, 2010

Source: http://www.basf.com/group/pressrelease/P-10-148



Information and Communication Tools
Knowledge and Information Flows

Embrapa

Knowledge and Information Flows

Knowledge and Information Flows

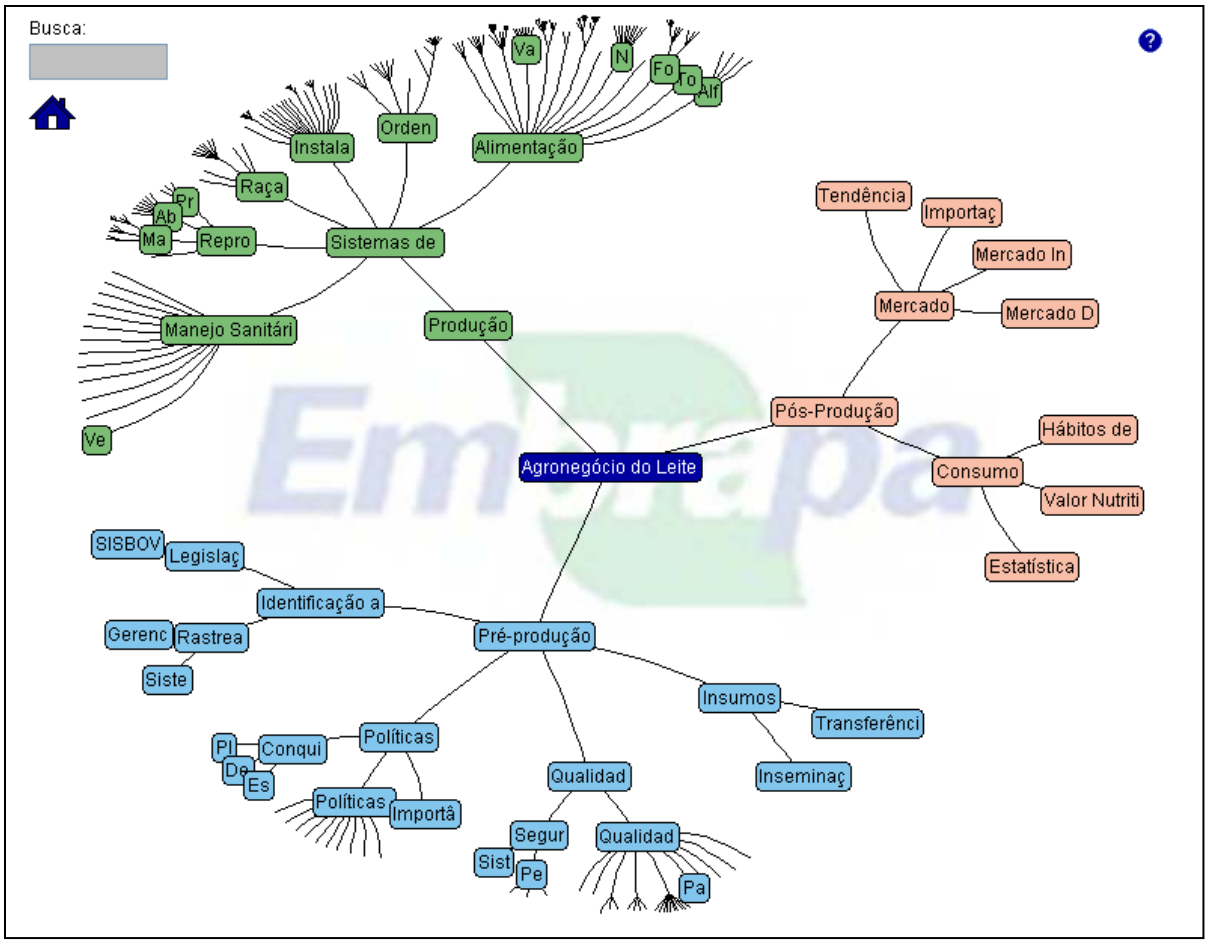
Social Nets

Knowledge and Information Flows

Digital Libraries

http://www.cnpat.embrapa.br/cnpat/cd/Menu.html

Knowledge and Information Flows



Digital Libraries

Knowledge and Information Flows

Educational Platforms

http://ccw.sct.embrapa.br/

Knowledge and Information Flows

Multimidia

Knowledge and Information Flows

TV – Field Days

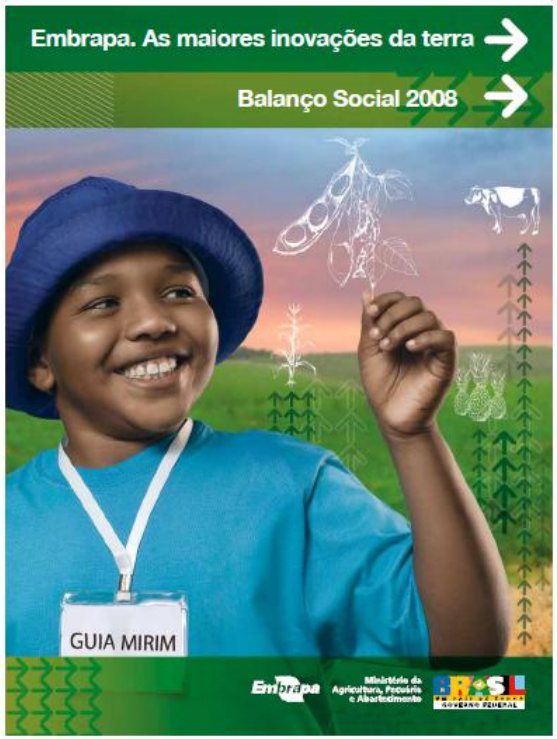
Training Centers

Knowledge and Information Flows

Fairs and Expos

Communication with Society

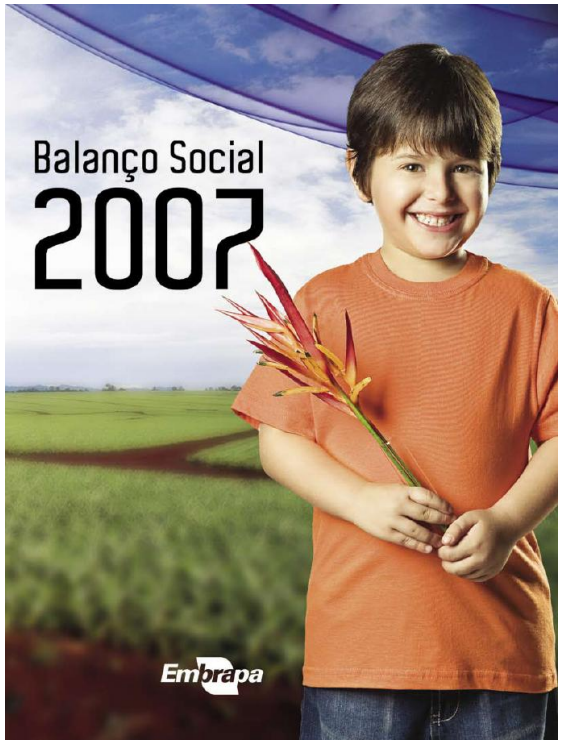
Stakeholders are members of "External Advisory Boards", for all 47 EMBRAPA's Research Centres

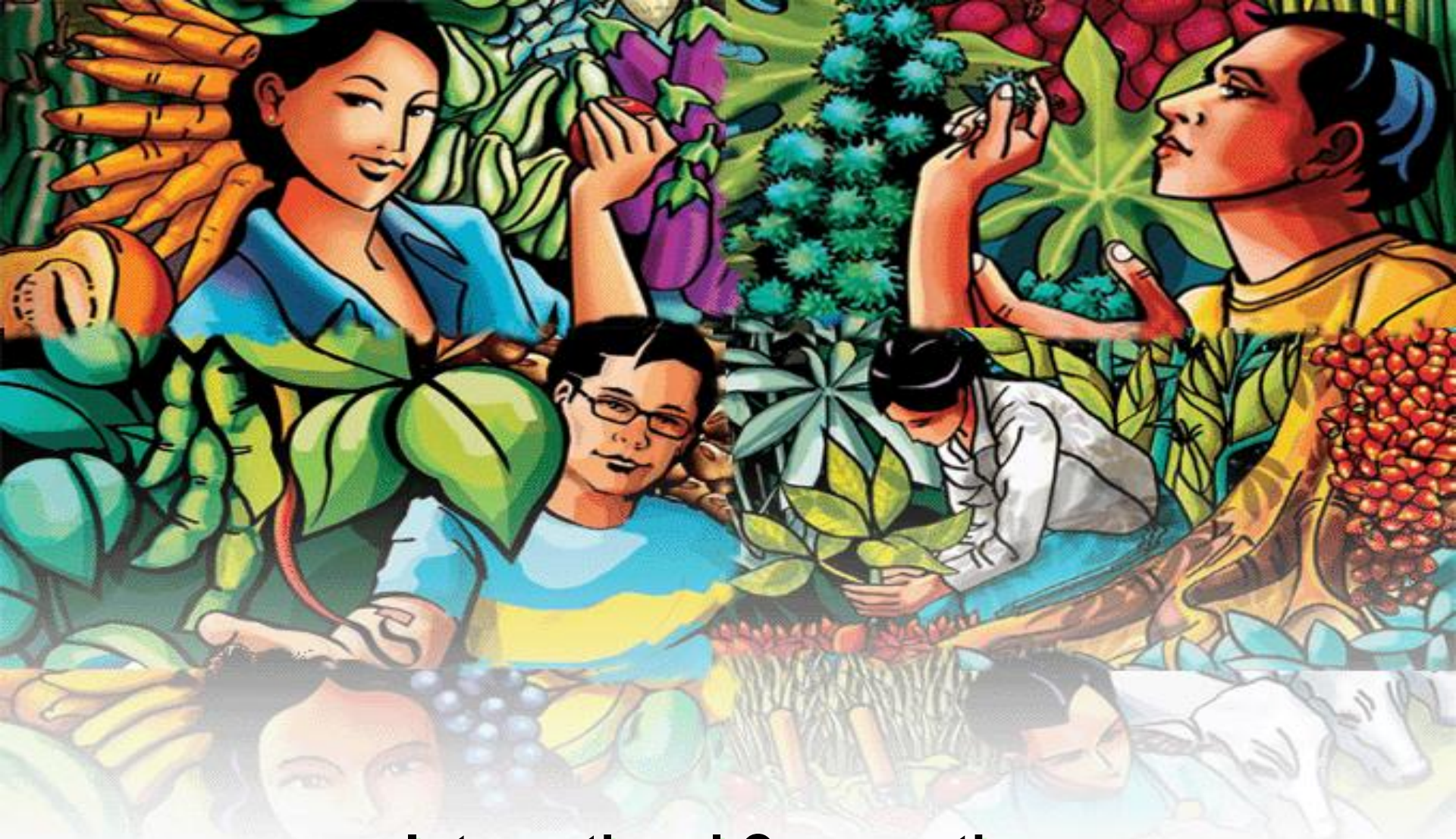


Embrapa publishes regularly its social balance

Every Brazilian Real (R$) invested in Embrapa returns between R$ 12 and R$14 to the Brazilian society (US$ 1.00 = R$ 1.77).

The Social balance of Embrapa in the past 10 years amounts to US$ 49.7 billion





International Cooperation

Embrapa

International Cooperation

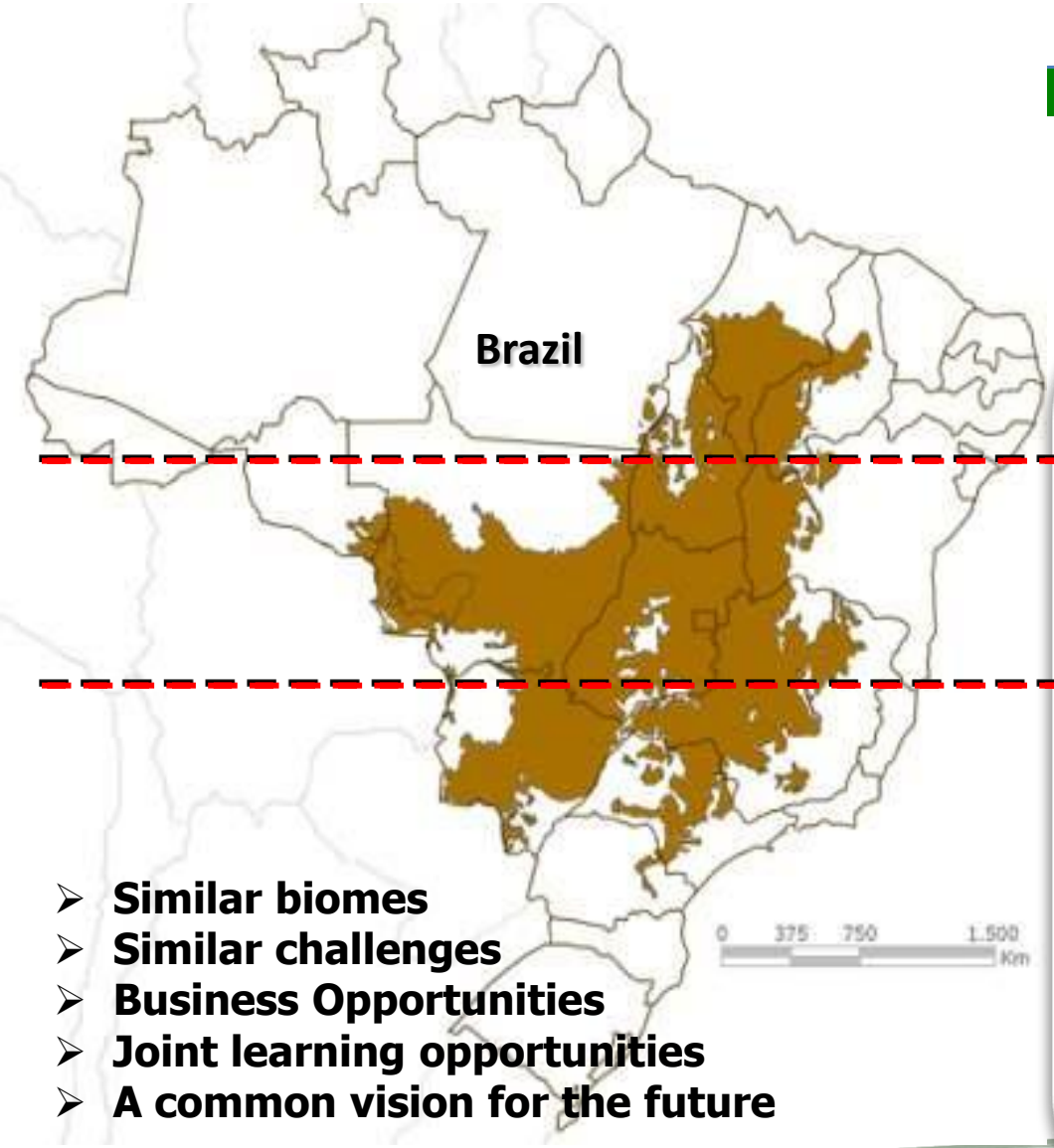
* Scientific Cooperation
* Technical Cooperation
* Technology Transfer

International Cooperation

- *Virtual laboratories*
- *Projects abroad*

Structuring Projects in Africa

PRO SAVANNAH PROJECT - MOZAMBIQUE



- **Similar biomes**
- **Similar challenges**
- **Business Opportunities**
- **Joint learning opportunities**
- **A common vision for the future**

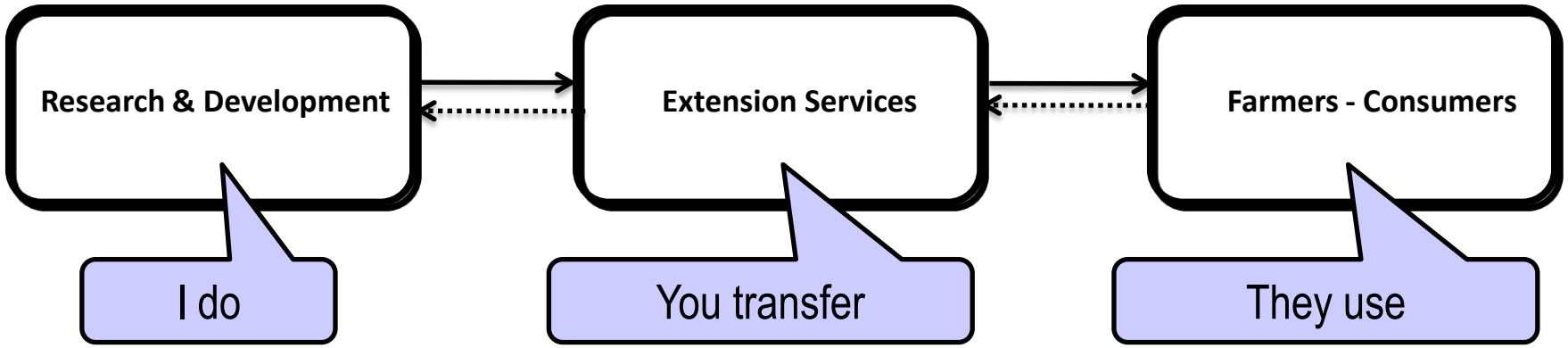
Why NACALA Corridor?

Embrapa

Final Message

Final Messages

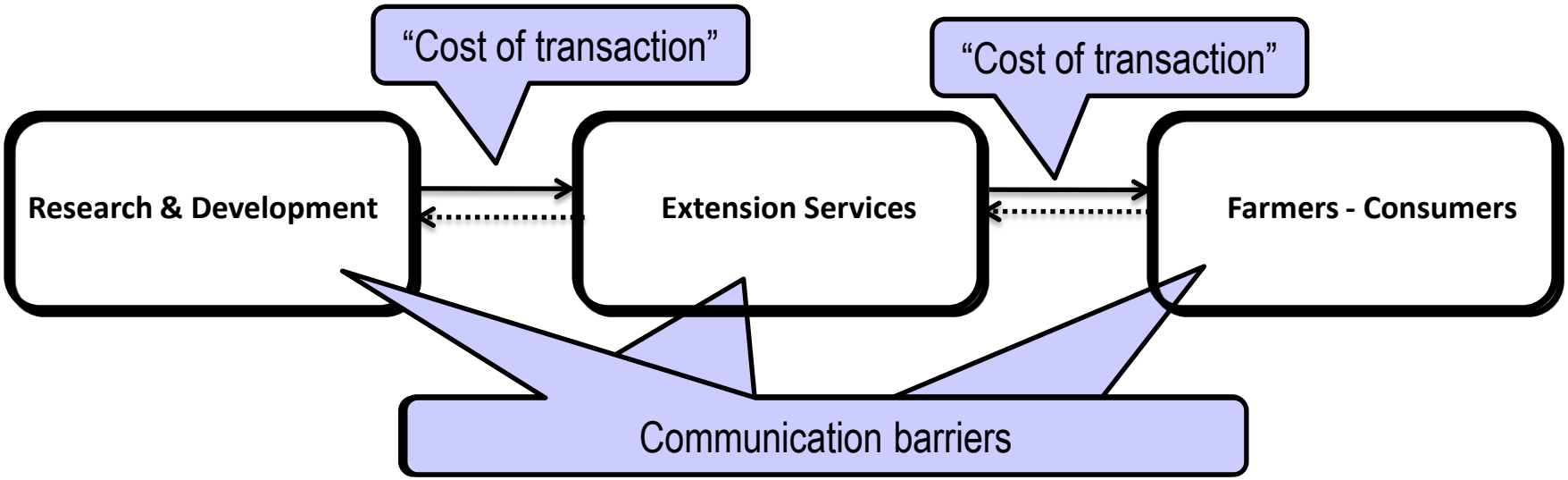
A linear, sequential strategy of agricultural R&D and extension services still dominate the configuration of most agricultural innovation systems around the world…



Final Messages

These linear, sequential models must evolve into more creative and interactive strategies. Agricultural innovation has to be understood as a continuum, from problem to solution...

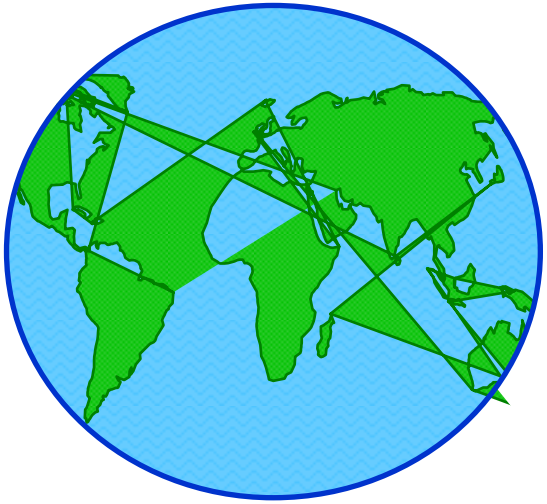
Complementarities, mix of capabilities and experiences, together with effective approaches to cooperation and networking must be viewed as key ingredients in developing this process.



Final Messages

Institutional Timing x Speed of Changes

Global Order?



Informed & Demanding Society

Social nets

Trans boundary Challenges

http://www.gcrio.org/USGCRP/forum/gifs/wheel55.gif

Strategic Intelligence & continuous foresight

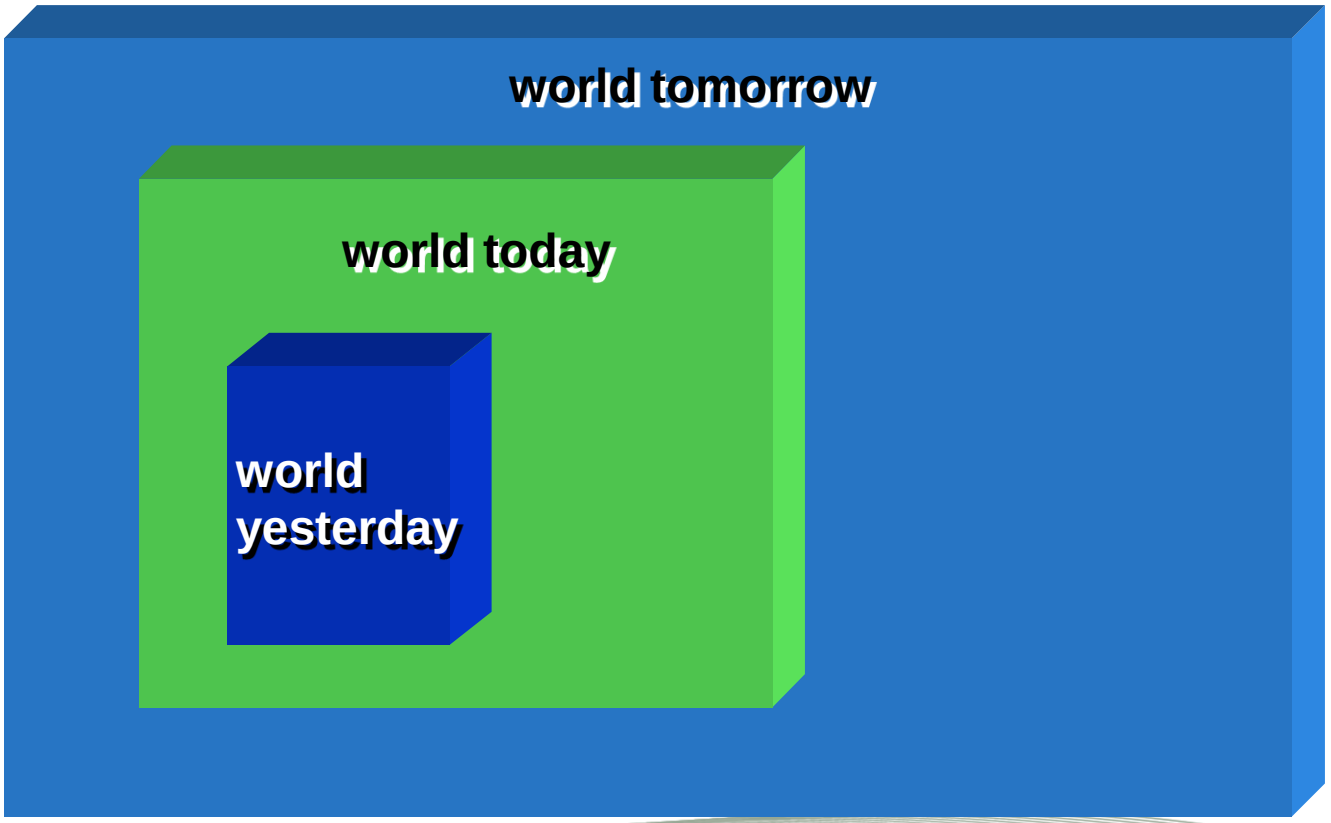
"Languages" & methods Communication

Effective approaches to networking

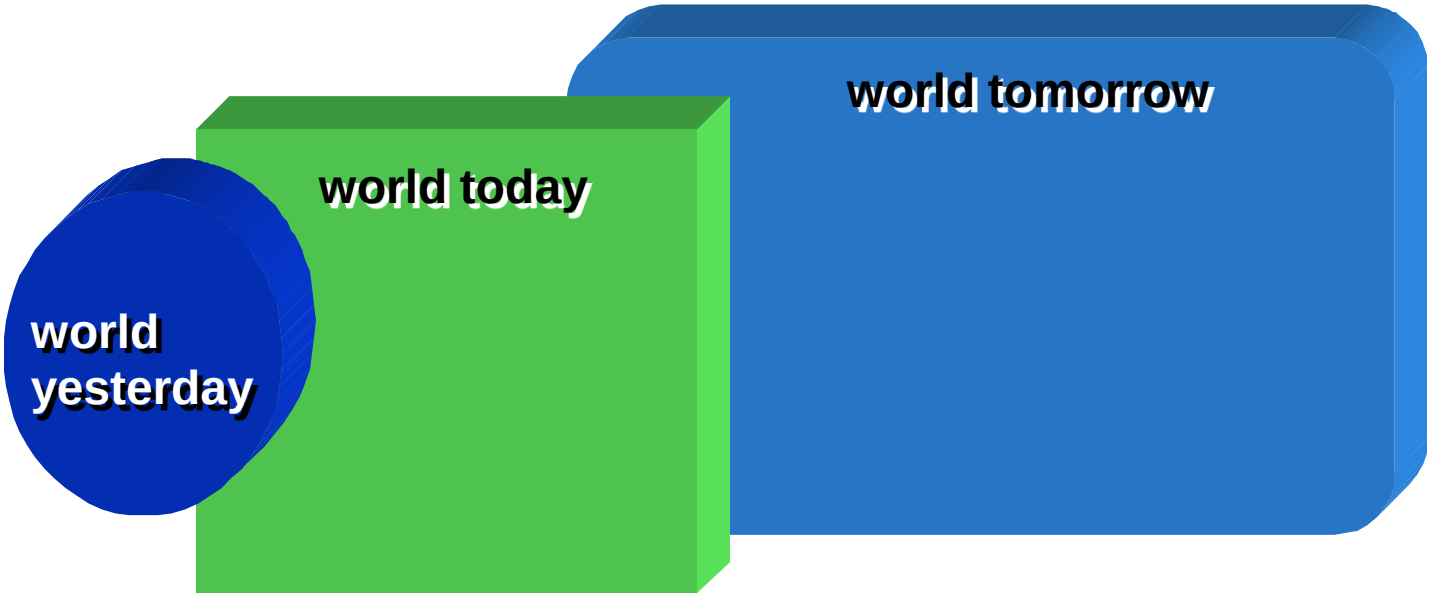
Embrapa

Being Prepared for Change

Moving out of the gradual view of change...



Being Prepared for Change



Success only to those able

to learn and innovate in a continuous manner.

Mauricio Antonio Lopes, PhD
Brazilian Agricultural Research Organization
Executive Director – R&D
mauricio.lopes@embrapa.br
de.pd@embrapa.br

Thank You!