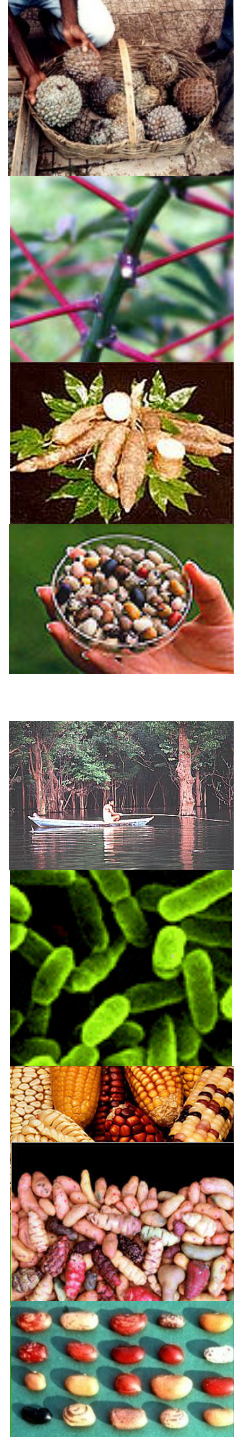




# Conservation and Sustainable Use of Biodiversity in Brazil

Maurício Antônio Lopes, PhD  
Embrapa Labex Korea

The 6th International Training Course on Environmental Policies (ITCEP)  
Incheon, South Korea May 10-20, 2010



# ABOUT BRAZIL

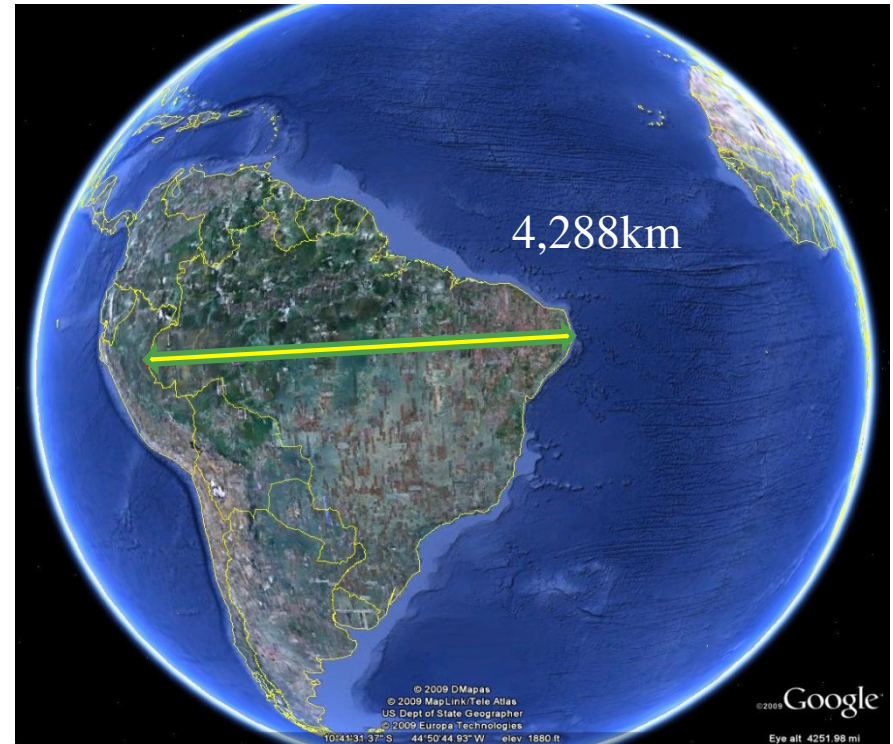
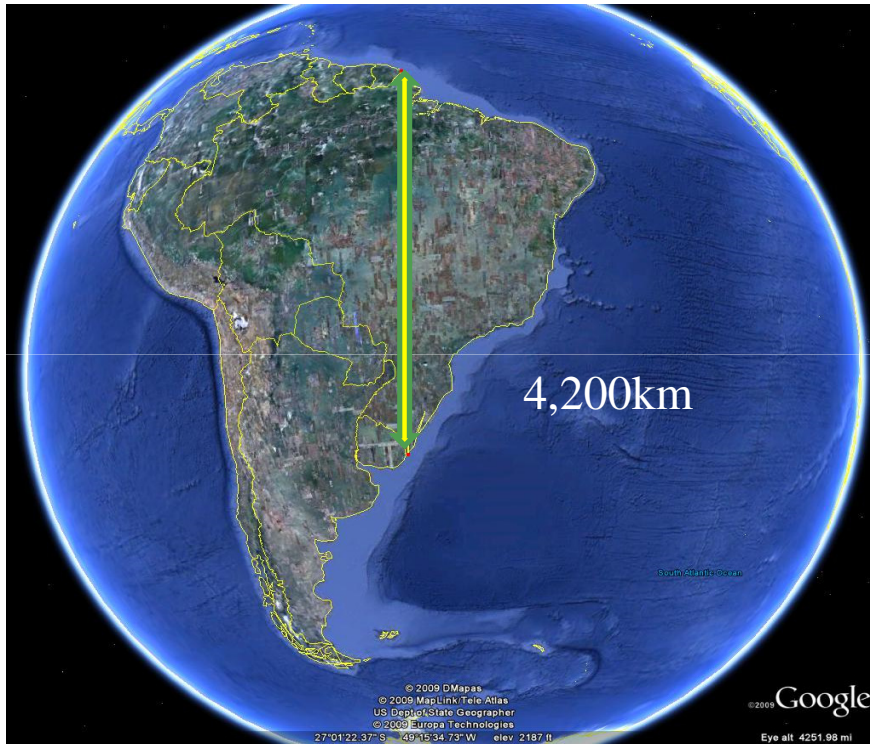


**The largest economy in South America and the 10th largest economy in the world;**

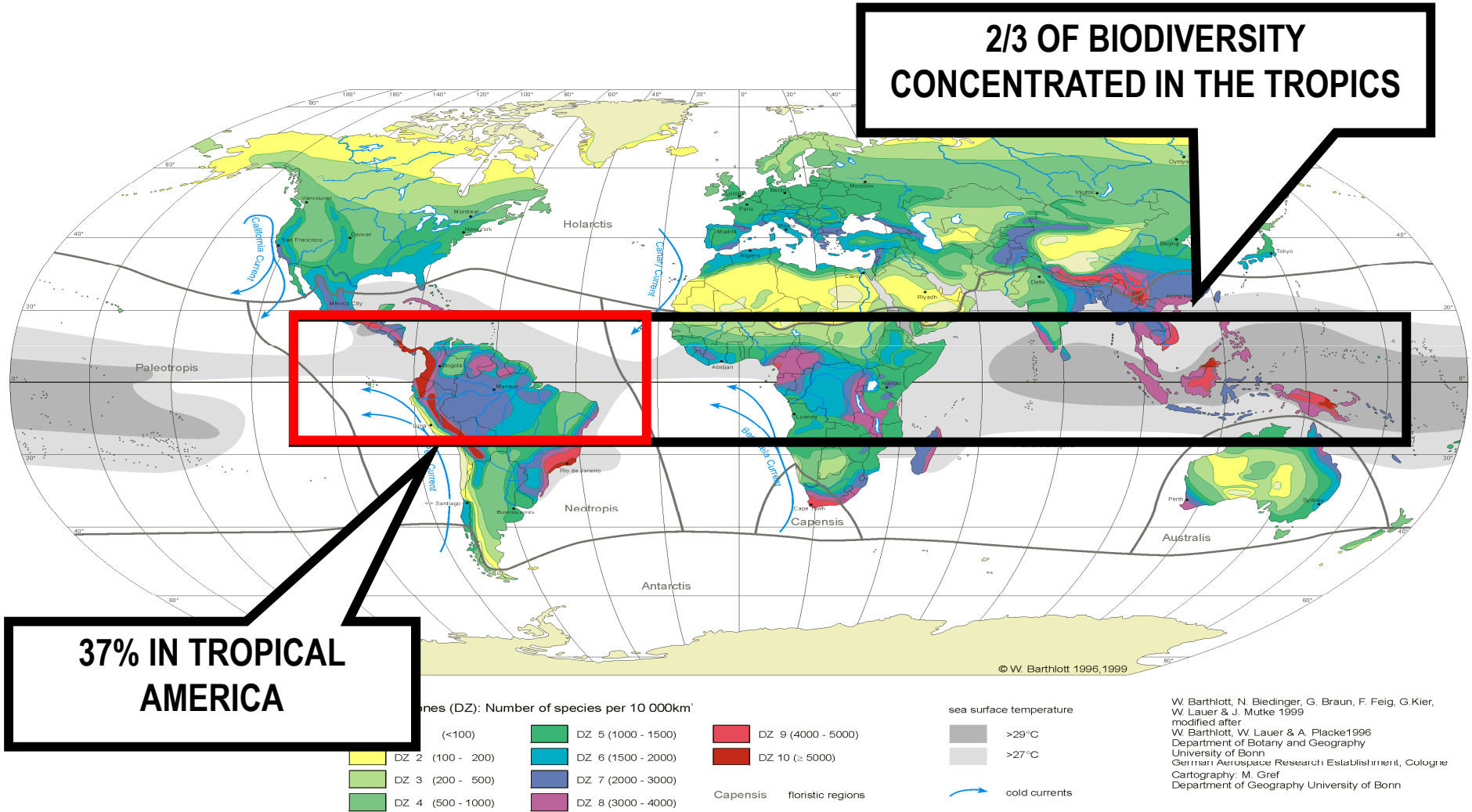
**5th largest country in the world in area (85 X Korea);**

**192 million inhabitants (5th after China, India, USA and Indonesia);**

# ABOUT BRAZIL

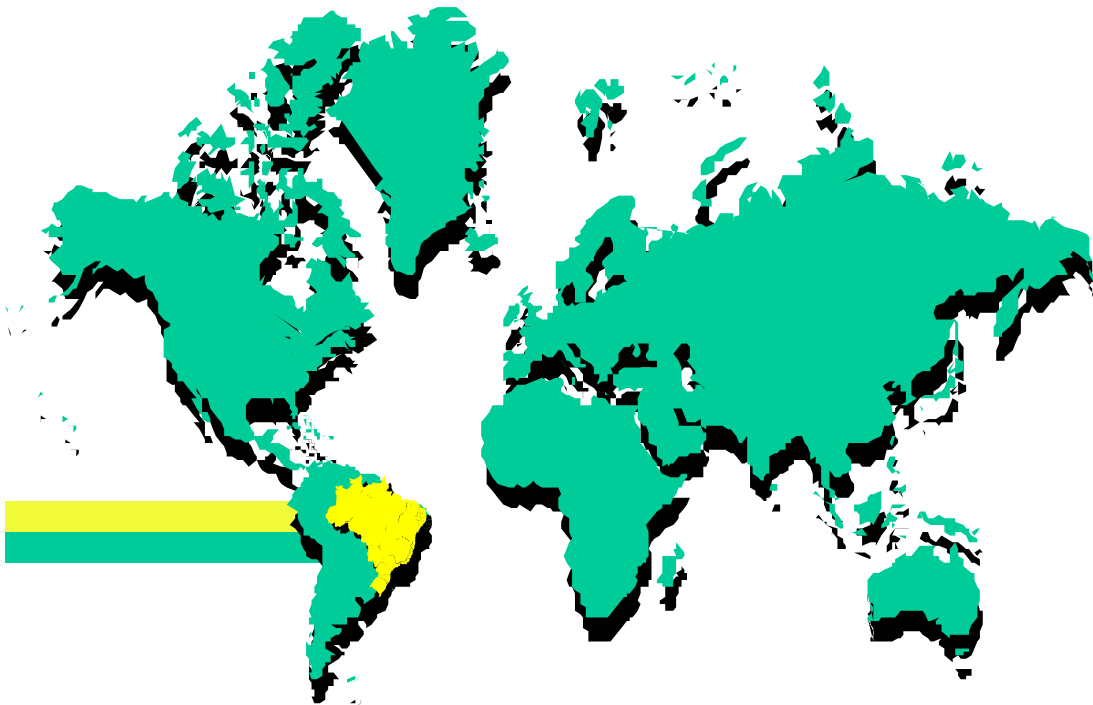


# BRAZILIAN BIODIVERSITY



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.

# BRAZILIAN BIODIVERSITY



Brazil is a megadiverse country

Currently about 70% of continental Brazil is still covered by natural ecosystems (~6 million km<sup>2</sup>)

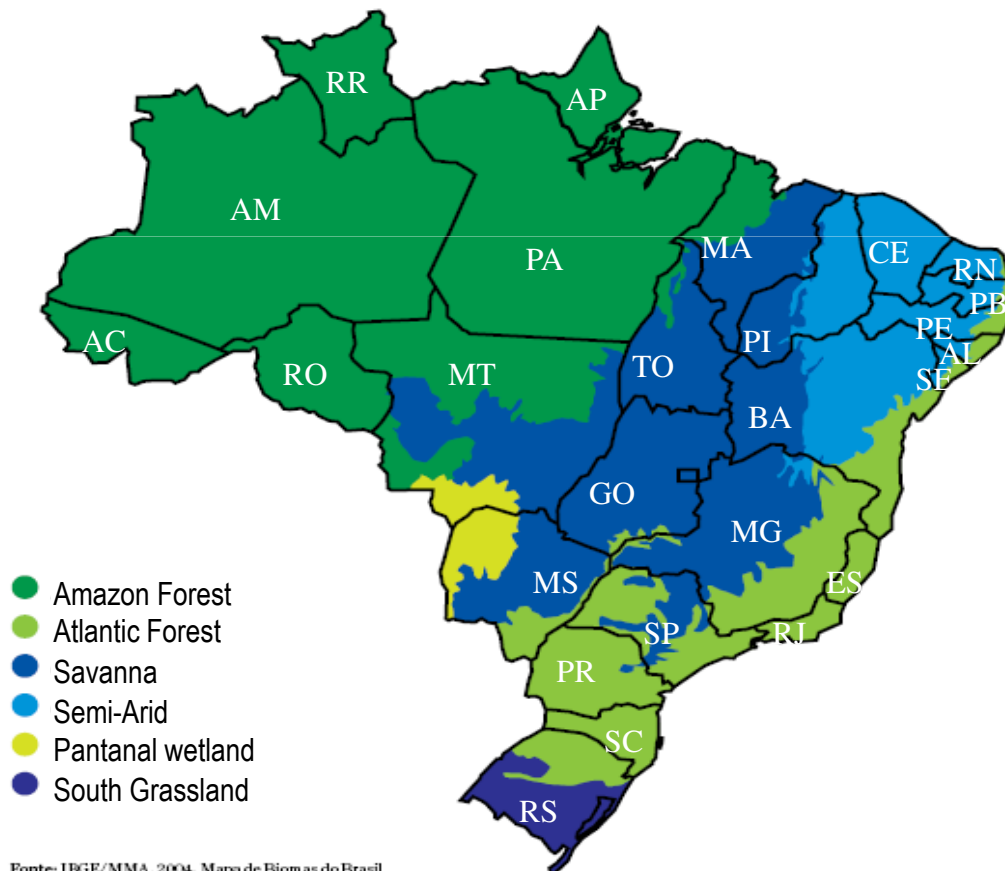
About 30% of the world's remaining natural forests are found in Brazil (~4.6 million km<sup>2</sup>)

About 15% of the world's currently described species are found in Brazil

Since most of the unknown species are found in the tropics, Brazil possibly holds as much as 25% of the world's total biodiversity

# BRAZILIAN BIODIVERSITY

## Brazilian Biomes



Fonte: IBGE/MMA, 2004. Mapa de Biomas do Brasil

**Plant diversity is estimated at 55,000 species, of which 22% endemic.**

**Vertebrate diversity is also quite high, with 524 species of mammals, more than 3,000 freshwater fish species, and about 1,677 bird species.**

**Terrestrial invertebrate diversity is impressive, with 10-15 million estimated species of insects**

# BRAZILIAN BIODIVERSITY

COUNTRY	Plants	Mammals	Birds	Reptile	Anfibian
Brasil	1	1	3	5	2
Colômbia	2	4	1	3	1
Indonésia	3	2	5	4	6
China	4	3	8	7	5
México	5	5	10	2	4
África do Sul	6	14	11	9	15
Venezuela	7	10	6	13	9
Equador	8	13	4	8	3
Peru	9	9	2	12	7
Estados Unidos	10	6	12	16	12
Papua Nova-Guiné	11	15	13	10	10
Índia	12	8	7	6	8
Austrália	13	12	14	1	11
Malásia	14	11	5	14	14
Madagascar	15	17	17	11	13
Congo (ex-Zaire)	16	7	9	14	16
Filipinas	17	16	16	7	17

## World Classification Biological Diversity



# BRAZILIAN BIODIVERSITY

COUNTRY	Plants	Mammals	Birds	Reptile	Anfibian
Brasil	1	4	3	5	2
Indonésia	2	2	1	6	11
África do Sul	3	14	17	14	17
Colômbia	4	12	5	11	1
Austrália	5	1	2	1	5
Papua Nova Guiné	6	9	10	13	8
México	7	3	6	2	5
China	8	7	9	7	4
Madagascar	9	7	8	3	3
Índia	10	11	12	4	10
Malásia	11	14	16	15	14
Venezuela	12	17	13	16	13
Peru	13	10	7	10	12
Filipinas	14	5	4	8	16
Equador	15	16	14	9	7
Estados Unidos	16	6	11	12	9
Congo (ex-Zaire)	17	12	15	17	15

## World Classification Endemic Species

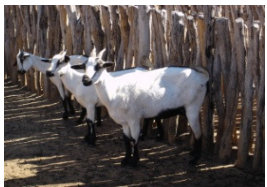




# BRAZILIAN BIODIVERSITY

Most livestock are not indigenous to Brazil. Periodic introductions resulted in a wide range of genetic diversity that, for centuries, supported domestic animal production in the country;

Natural selection → adaptation to biotic and abiotic pressures;



**Moxotó goats**



**Blue goats**



**Canindé goats**



**Santa Inês Sheep**



**Baio type buffalo**



**Carabao buffalo**



**Pantaneiro cattle**



**Pantaneiro horse**



**Curraleiro cattle**



**Criollo Lanado sheep**



**Lavradeiro horses**



**Piau pig**



**Colonial chicken**



**Caracu**



**Mocho Nacional**

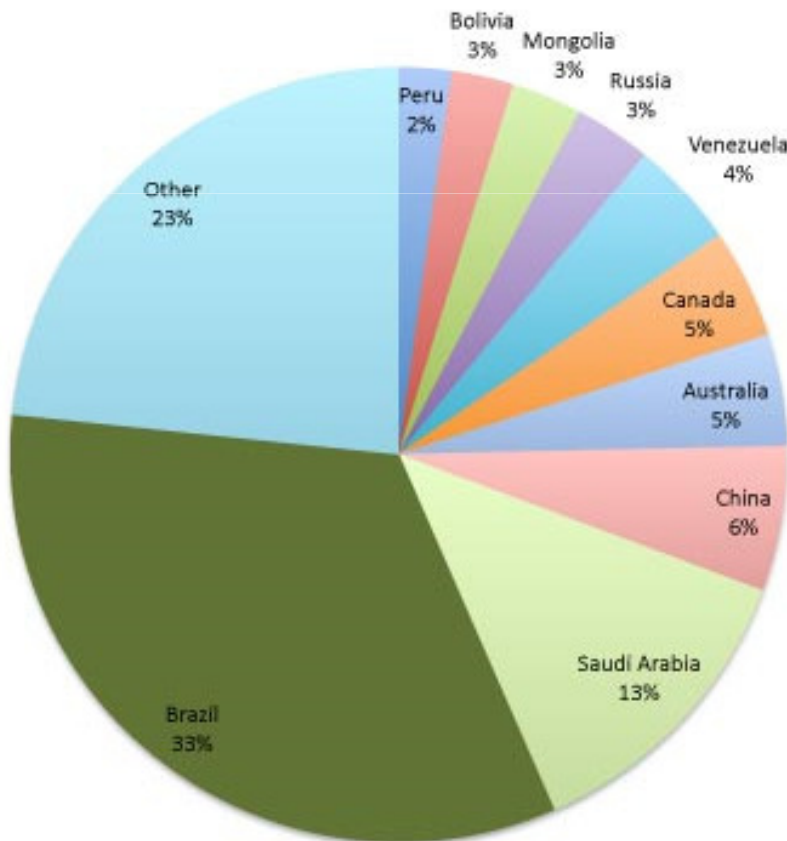


**Crioulo Lagano**

# BRAZIL AT THE FOREFRONT OF CONSERVATION

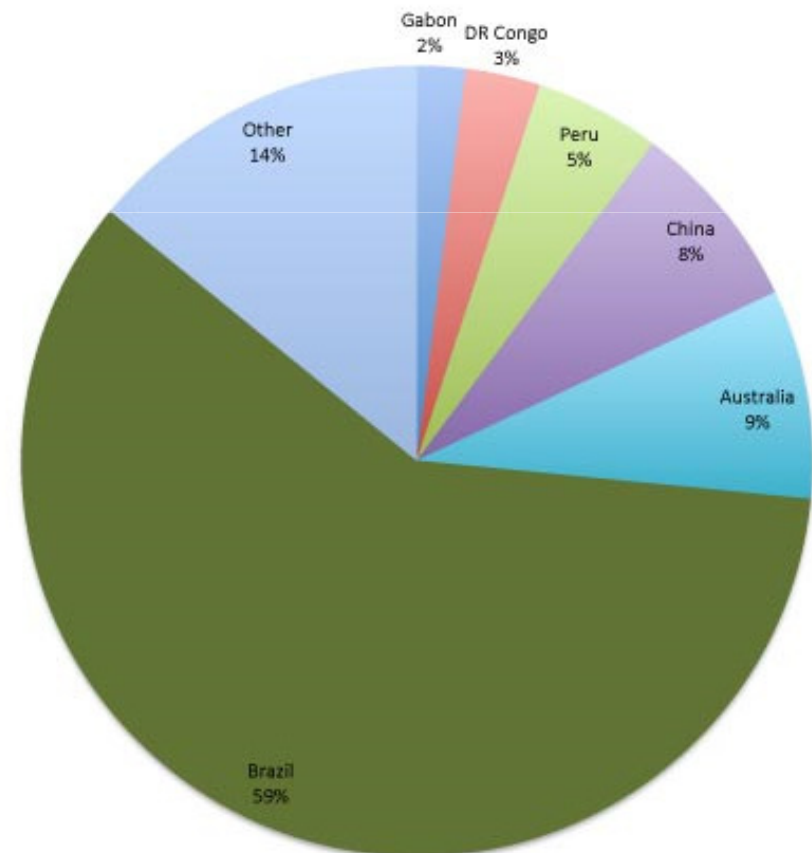
Brazil now has the largest area of protected land, according to UNEP-WCMC data.

Share of terrestrial protected areas, established since 1990



mongabay.com using UNEP World Conservation Monitoring Centre data

Share of terrestrial protected areas, established since 2000



mongabay.com using UNEP World Conservation Monitoring Centre data

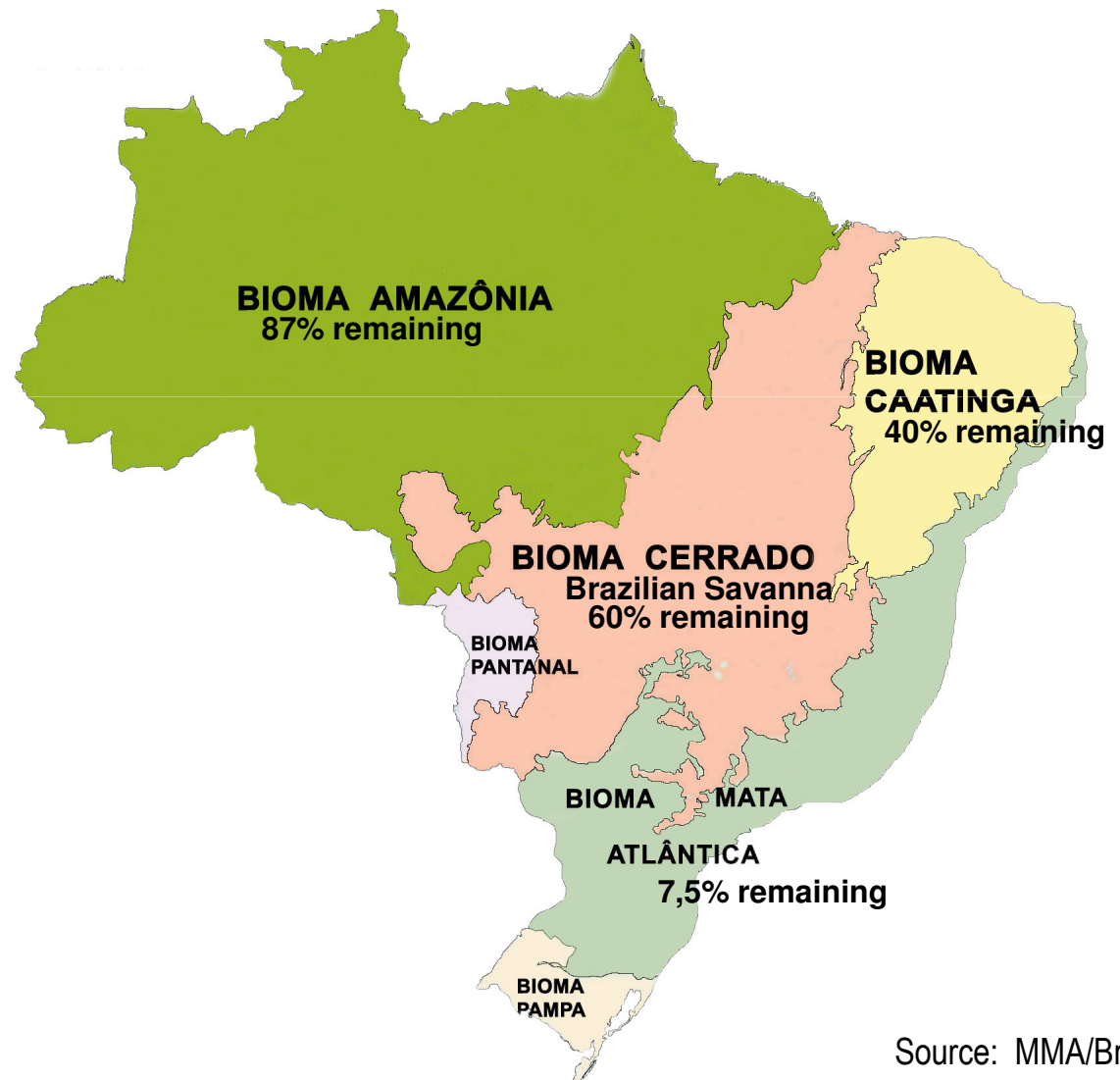
# BRAZILIAN BIODIVERSITY

## Conservation Strategies

Brazil has a total of over 90 million ha in Protected Areas within the National System of Conservation Units (SNUC)

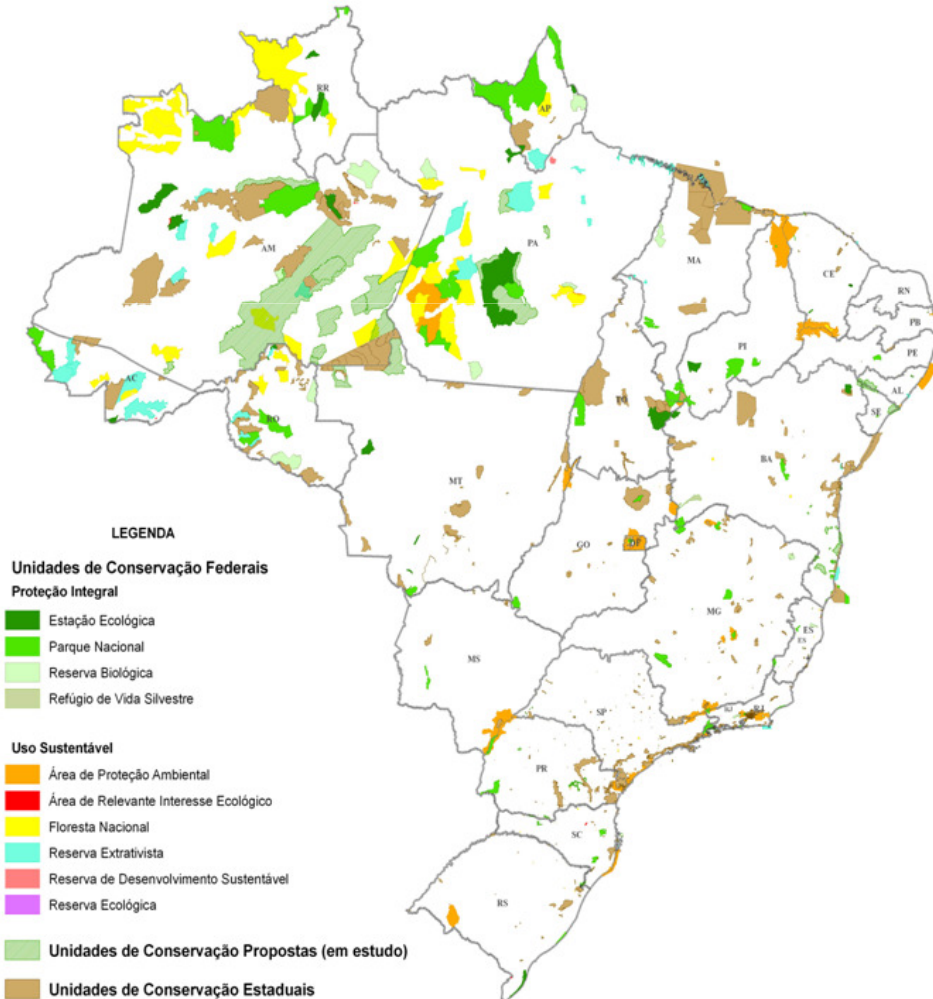
65 mi ha under the stewardship of the Federal Government, and 28 mi are under the stewardship of State Conservation Agencies.

SNUC also includes municipal and private protected areas.



# BRAZILIAN BIODIVERSITY

## Conservation Areas Brazil 2006



**Federal CAs**  
679 units  
~65 million ha

274 public  
425 private

**State CAs**  
716 units  
~28 million ha

452 public  
264 private

**1.395**  
**Conservation Units**  
**~ 93 million ha**  
**10,9% Brazilian**  
**Territory**

# BRAZILIAN BIODIVERSITY

## Conservation Strategies

Apart from the SNUC, Brazil has reserved over 110 million hectares as Indigenous Lands, which also play a key role as protected areas for biodiversity.

Together, the SNUC and the Indigenous Lands cover more than 200 million hectares (or about 23% of the Brazilian Territory).

Additionally, our Forestry Code requires each private property to set aside as Areas for Permanent Protection the natural vegetation along rivers, slopes, mountains and habitats for endangered species.



580 Indigenous Lands  
~ 110 millions ha  
11,58% Brazilian Territory

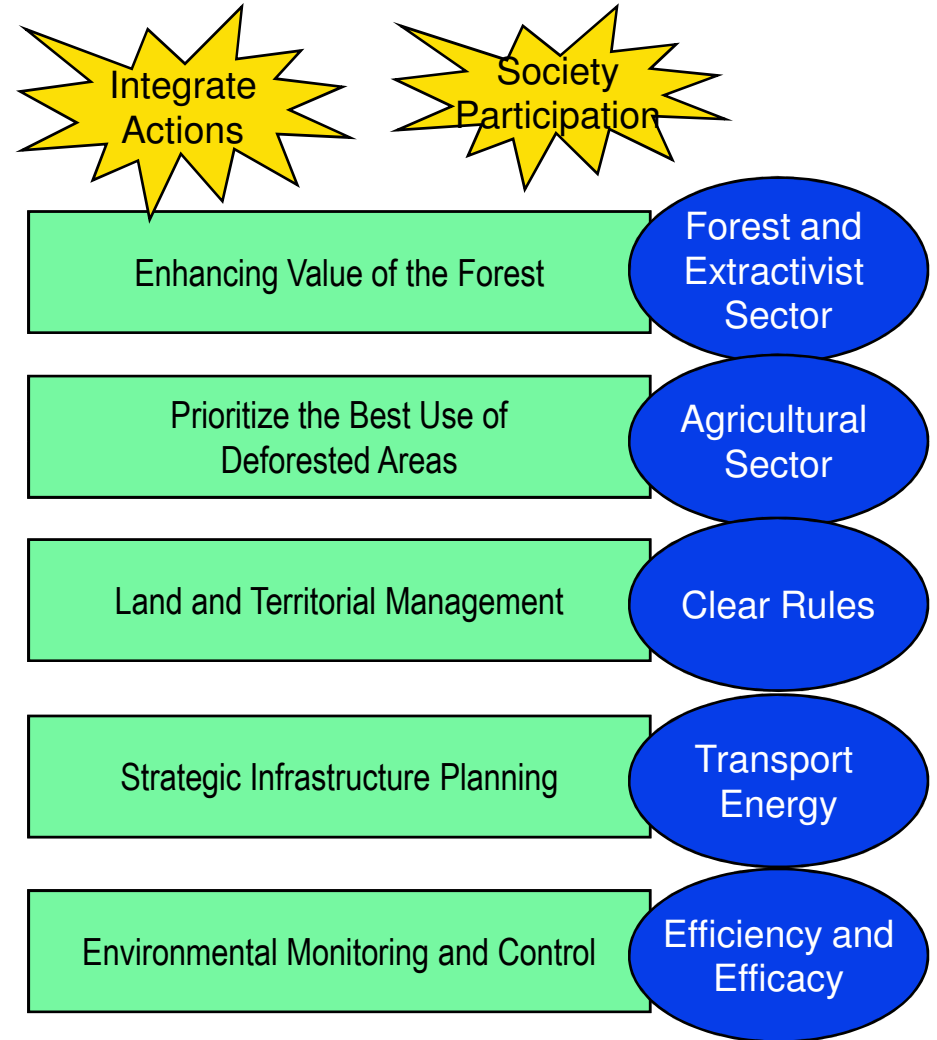
Source: MMA/Brazil

# BRAZILIAN BIODIVERSITY

## Amazon



Source: Embrapa Monitoramento por Satélite



Source: MMA/Brazil

# BRAZILIAN BIODIVERSITY

Figure 1. Annual rate of deforestation in the Brazilian Legal Amazon\*

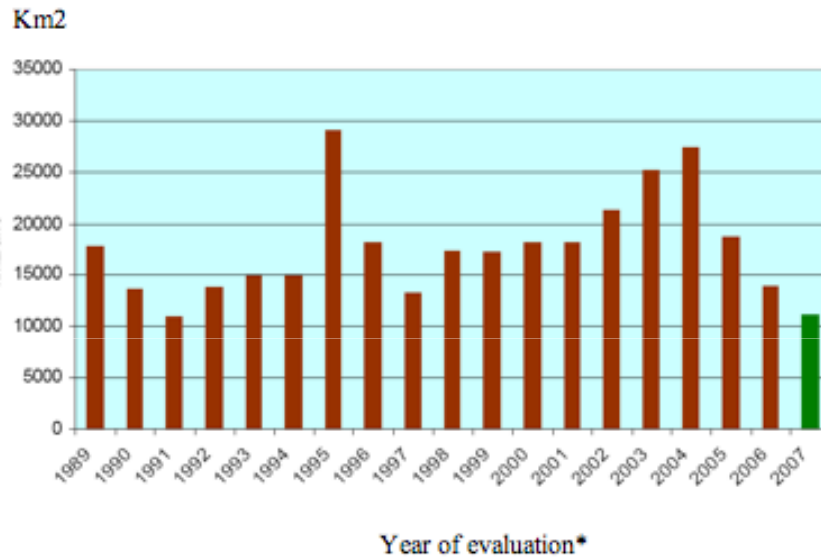
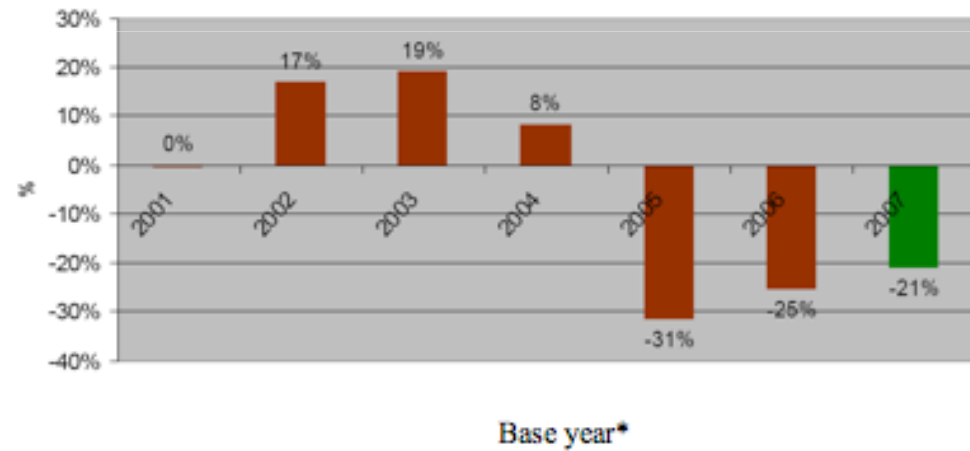


Figure 2. Variation (in relation to previous year\*)



\* - The year covers periods from August to July (e.g. August 2001 to July 2002)

# BIODIVERSITY AND SOCIAL DIVERSITY

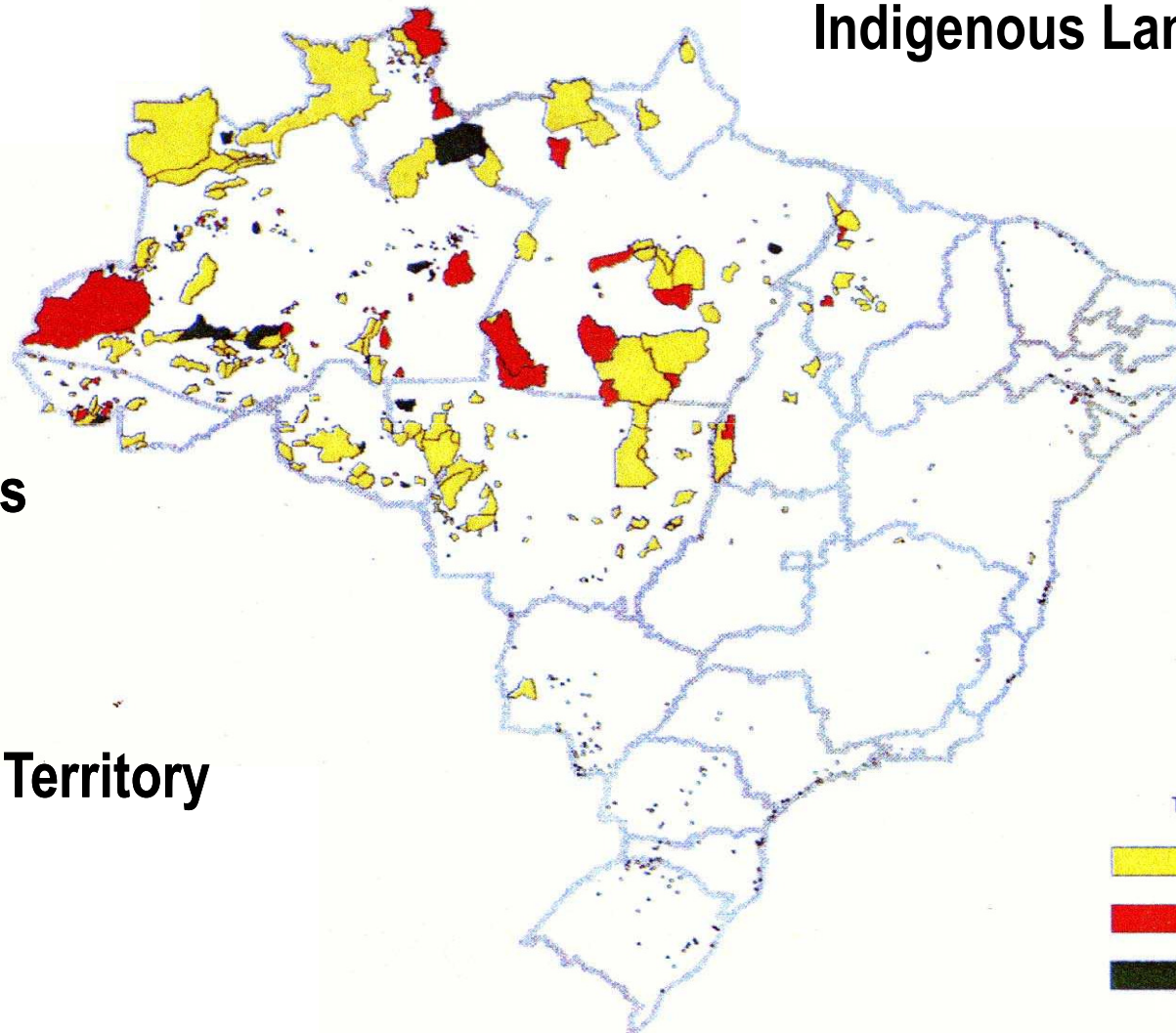


Source: Pommez, 2003.



# BIODIVERSITY AND SOCIAL DIVERSITY

## Indigenous Lands in Brazil



**230 Ethnic Groups**

**180 Languages**

**11,92 % Brazilian Territory**

**101.845.857 ha**

# BRAZILIAN BIODIVERSITY

*Embrapa Recursos Genéticos e Biotecnologia  
Empresa Brasileira de Pesquisa Agropecuária  
Ministério da Agricultura, Pecuária e Abastecimento  
Parque Estação Biológica Final W/5 Norte  
Fone: (61) 3448-4770, 3448-4769 Fax: 3340-3666  
Brasília, DF*

www.cenargen.embrapa.br  
sac@cenargen.embrapa.br

**CULTURAL RECOVERY, SUSTAINABLE MANAGEMENT AND CONSERVATION OF AGROBIODIVERSITY**

**RESGATE CULTURAL, MANEJO SUSTENTÁVEL E CONSERVAÇÃO DA AGROBIODIVERSIDADE**

Regem: 2000 exemplares

**Embrapa**  
Recursos Genéticos e Biotecnologia

Ministério da Agricultura, Pecuária e Abastecimento

**PROSI**  
UM PAÍS DE TODOS  
GOVERNO FEDERAL

**Embrapa**  
Brasília, DF  
2006



Source: Embrapa Genetic Resources and Biotechnology

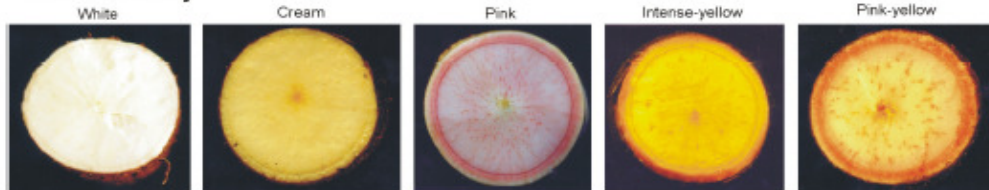
# BRAZILIAN BIODIVERSITY



Source: Embrapa Genetic Resources and Biotechnology

# BRAZILIAN BIODIVERSITY

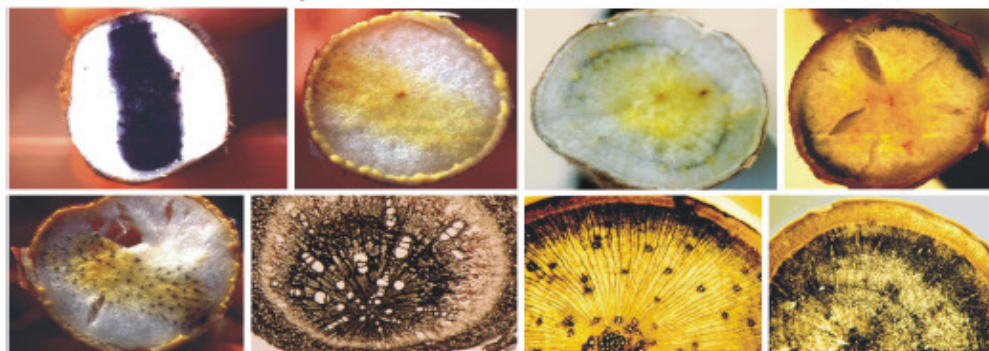
## Color Diversity



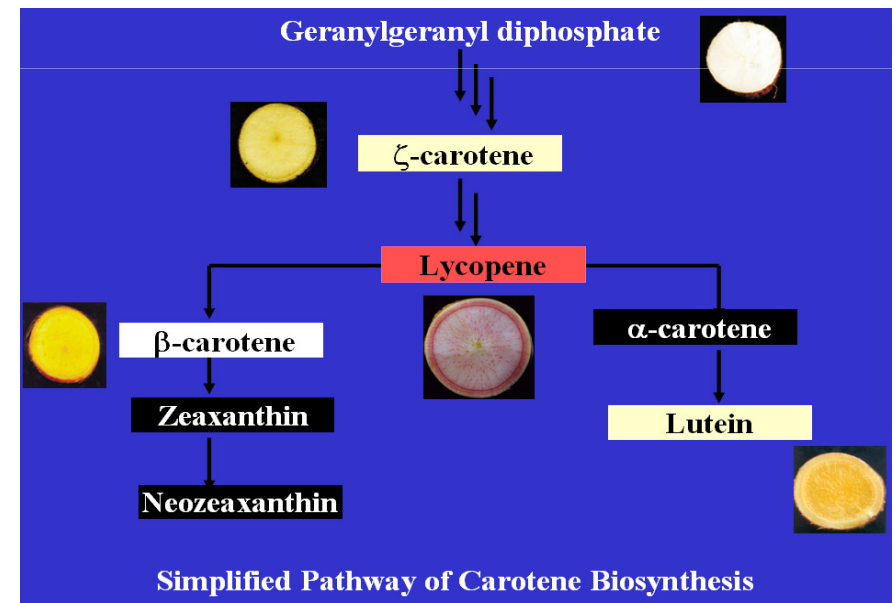
## Structure Variability



## Starch Pattern Variability



## Cassava Root Mutants Starch & Pigments



# BRAZILIAN BIODIVERSITY

## Fruit Species of the Brazilian Savannah – “Cerrado”



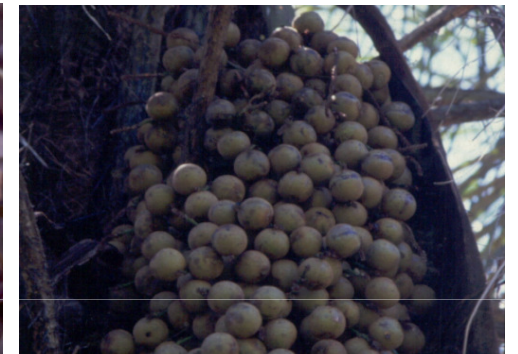
Araticum



Cagaita



Baru



Macaúba



Barbatimão



Faveira



Pequi



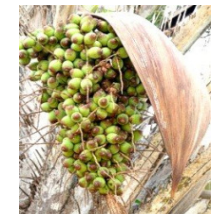
Mangaba

# BRAZILIAN BIODIVERSITY

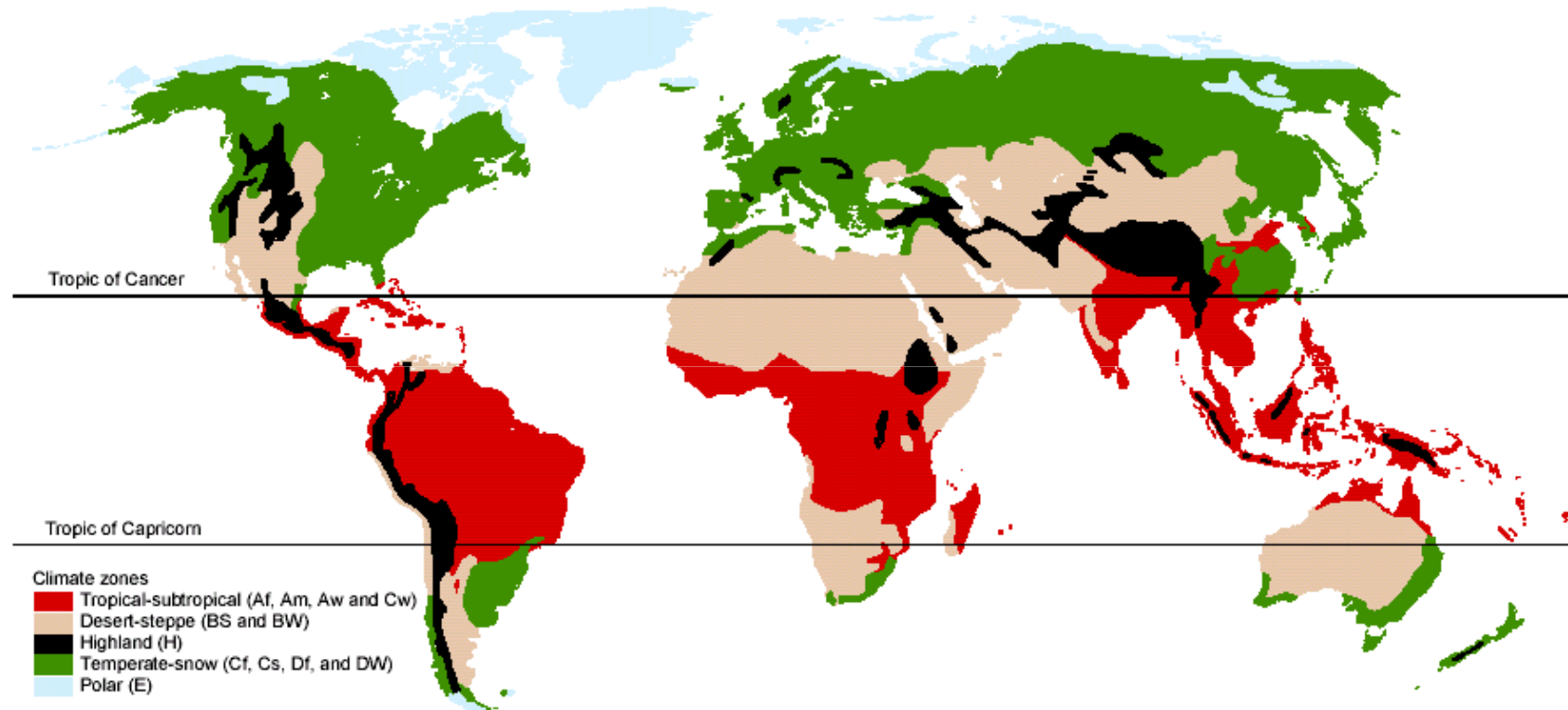
Brazil has around 100 oil plants in the Cerrado and Amazon Biomes with potential to be developed as oil crops for energy and other industrial purposes

<i>Acrocomia aculeata</i> (macauba palm)	<i>Licania rigida</i> (oiticica)
<i>Astrocaryum murumuru</i> (murumuru)	<i>Mauritia flexuosa</i> (buriti palm)
<i>Astrocaryum vulgare</i> (tucumã)	<i>Maximiliana maripa</i> (inaja palm)
<i>Attalea geraensis</i> (indaiá-rateiro)	<i>Oenocarpus bacaba</i> (bacaba-do-azeite)
<i>Attalea humillis</i> (pindoba)	<i>Oenocarpus bataua</i> (patauá)
<i>Attalea oleifera</i> (andaiá)	<i>Oenocarpus distichus</i> (bacaba-de-leque)
<i>Attalea phalerata</i> (uricuri)	<i>Paraqueiba paraensis</i> (mari)
<i>Caryocar brasiliense</i> (pequi)	<i>Sesamum indicum</i> (benneseed)
<i>Cucumis melo</i> (melon)	<i>Theobroma grandiflorum</i> (cupuassu)
<i>Jatropha curcas</i> (pinhão-manso)	<i>Trithrinax brasiliensis</i> (carandaí)
<i>Joannesia princeps</i> (cutieira)	

Source: Nass et al. (2007)



# BIODIVERSITY AND CLIMATIC CHANGE

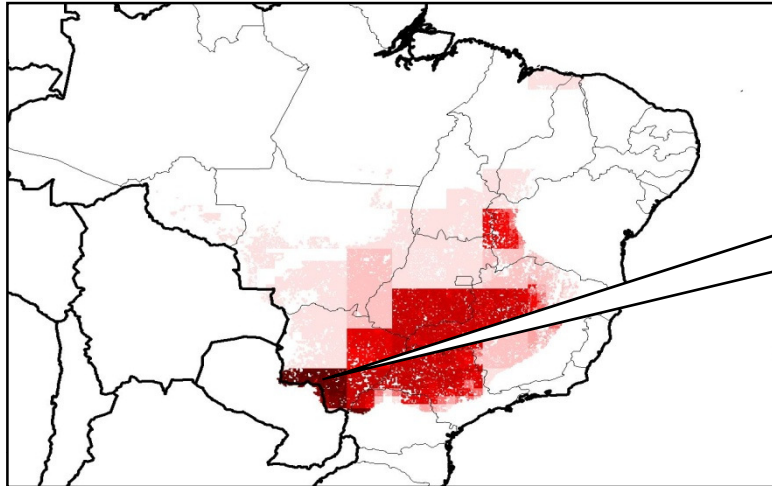


## SUSTAINABILITY OF TROPICAL BIODIVERSITY

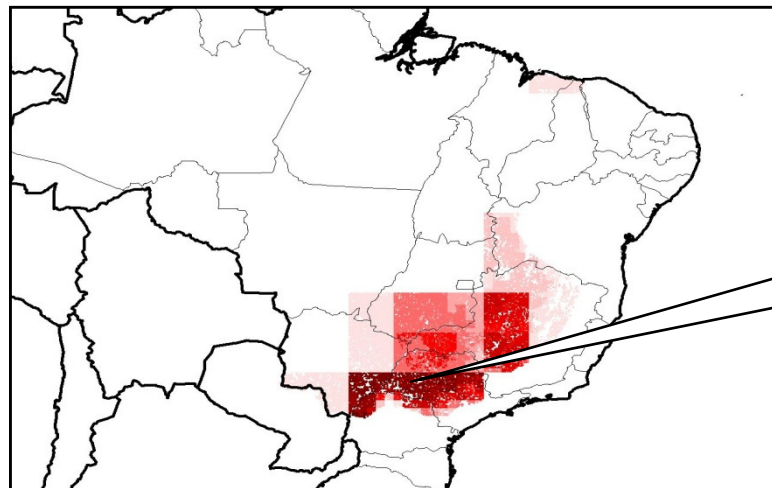
Global Changes and Intensification of Biotic and Abiotic Stresses

Loss of Diversity – Environmental Services - Agriculture

# BIODIVERSITY AND CLIMATIC CHANGE



**Cenário 1 de mudança climática =  
144 espécies perdidas**



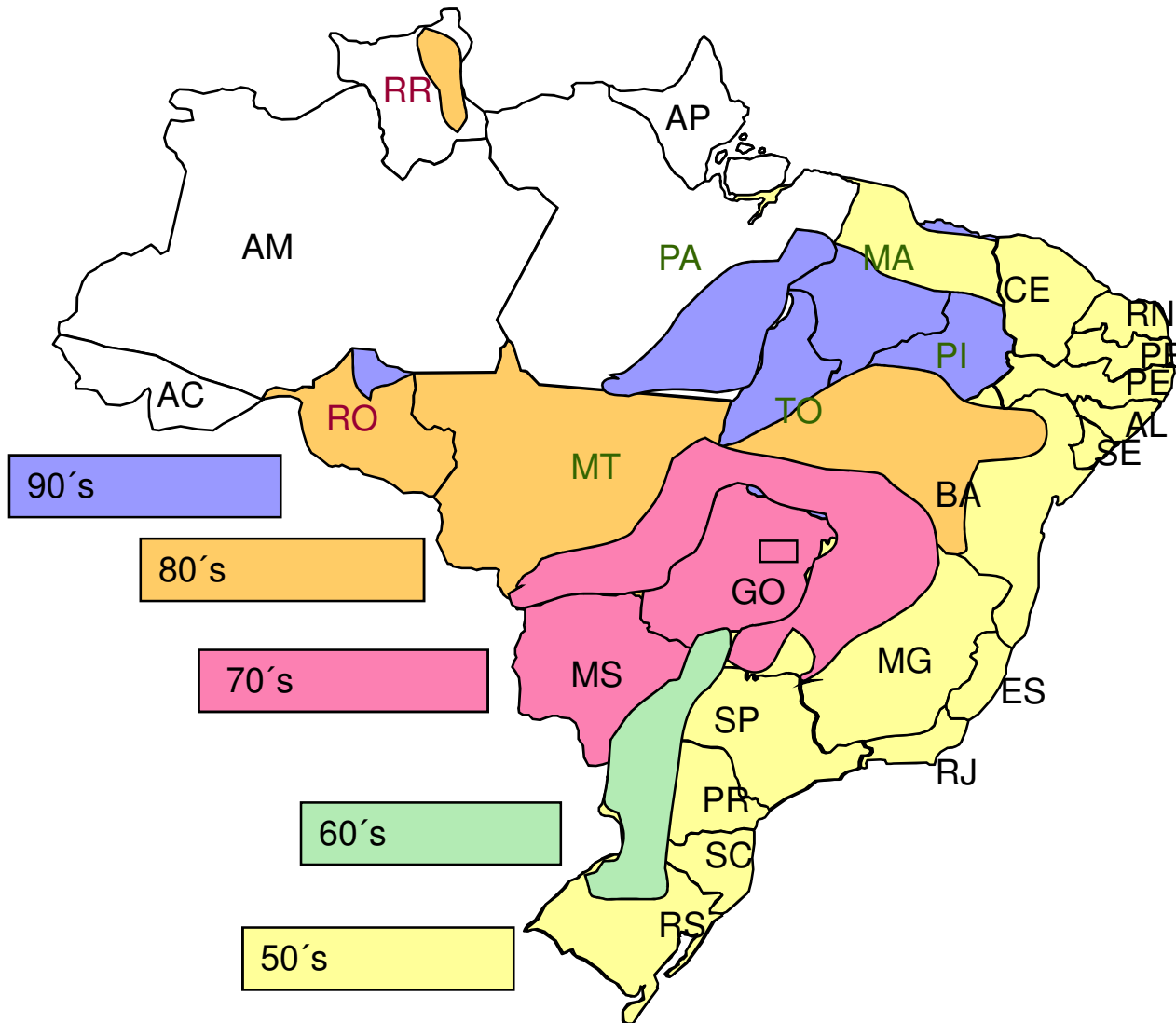
**Cenário 2 de mudança climática =  
106 espécies perdidas**

**Cenário 1.** HHGGAX50 - 1%/yr CO<sub>2</sub>, no sulfate aerosols forcing

**Cenário 2.** HHGSDX50 - 0.5%/yr CO<sub>2</sub>, sulphate aerosol forcing



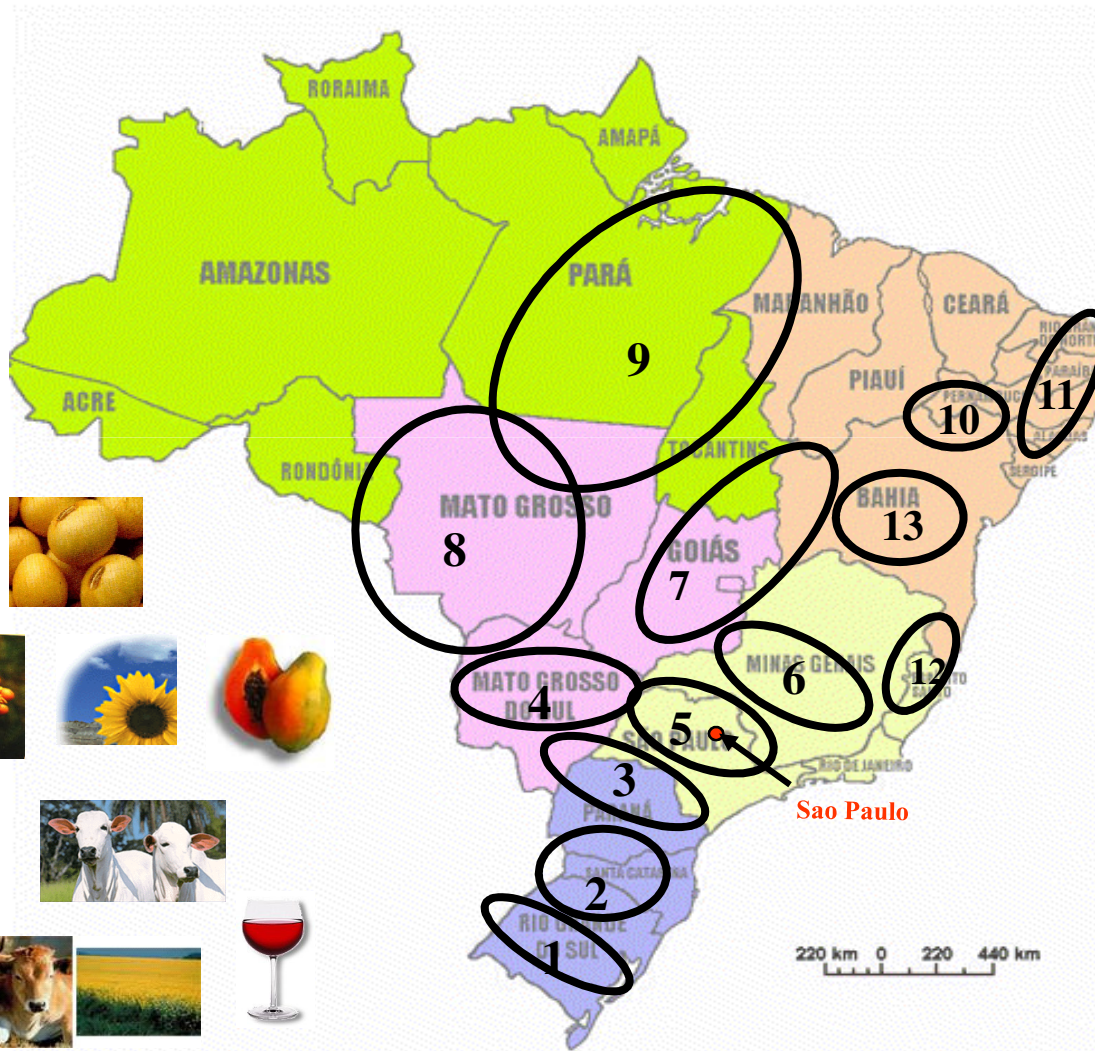
# BIODIVERSITY AND AGRICULTURE



**Evolution of the  
Brazilian Agriculture**

**From the 50's to the 90's**

# BIODIVERSITY AND AGRICULTURE



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

# BIODIVERSITY AND AGRICULTURE

## Exports

In 2008 Brazil exported more than 1500 types of agricultural products to foreign markets

## Commercial partners

Around 79% of the Brazilian food production is consumed domestically and 21% is shipped to over 212 foreign markets

Product	Production	Exports
Sugar	1 <sup>st</sup>	1 <sup>st</sup>
Orange juice	1 <sup>st</sup>	1 <sup>st</sup>
Coffee	1 <sup>st</sup>	1 <sup>st</sup>
Beef	2 <sup>nd</sup>	1 <sup>st</sup>
Soybean	2 <sup>nd</sup>	1 <sup>st</sup>
Tobacco	3 <sup>rd</sup>	1 <sup>st</sup>
Broiler	3 <sup>rd</sup>	2 <sup>nd</sup>
Corn	3 <sup>rd</sup>	4 <sup>th</sup>

Source: SPA/MAPA (Agricultura Brasileira em Números)



# LEGAL BIODIVERSITY FRAMEWORK IN BRAZIL



## Main Regulation

**Provisional Act # 2,186-16, dated August 23, 2001**

**Decree # 3,945 dated September 28, 2001**

## Relevant Regulation

**Act # 11,105, dated March 24, 2005 – Biosafety Law**

**Act # 9,456, dated April 25, 1997 – Plant Variety Protection Law**

**Act # 9,279, dated May 14, 1996 – Intellectual Property Law**

**Act # 6,001, dated December 19, 1973 – Indigenous Peoples' Code**

**Decree # 3,551, dated August 4, 2000 – Cultural Heritage**

# LEGAL BIODIVERSITY FRAMEWORK IN BRAZIL



## Breadth of Provisional Act # 2,186-16

**Access to genetic heritage existing in the country shall only take place with an authorization from the Federal Government and its commercialization and use for any purpose shall be submitted to inspection, restrictions and sharing of benefits respecting the terms and conditions established in this Provisional Act and its complementary legislation.**

# LEGAL BIODIVERSITY FRAMEWORK IN BRAZIL



## Breadth of Provisional Act # 2,186-16

The State recognizes the right of the indigenous communities and of the local communities to decide on the use of the traditional knowledge related to the genetic heritage of the country, in the terms of the Provisional Act and its complementary legislation.

# LEGAL BIODIVERSITY FRAMEWORK IN BRAZIL



## - Implementation -

The Genetic Heritage Governing Council - CGEN  
Ministry of Environment

Regulatory and deliberative body composed of representatives of Federal Government entities responsible for the various actions covered by the Provisional Act.

# LEGAL BIODIVERSITY FRAMEWORK IN BRAZIL



## **International Treaty on Plant Genetic Resources For Food and Agriculture - FAO**

**The objectives of the International Treaty are conservation and sustainable use of plant genetic resources for food and agriculture, as well as the right to equitably participate in sharing benefits arising from the utilization of plant genetic resources for food and agriculture pursuant to the Convention on biological diversity.**

**It is all aiming at sustainable agriculture and assurance of food safety.**



# Brazil Korea Cooperation

<http://labexkorea.wordpress.com/>



The screenshot shows the homepage of the Labex Korea WordPress site. At the top, there is a navigation menu with links: FRONT PAGE, ABOUT LABEX, ADDRESS, PARTNERS, DOWNLOADS, and EDITOR. Below the menu is a red banner with the Embrapa logo on the left and the text 'Labex Korea' in the center. To the right of the banner is a world map with a red overlay. Below the banner, the main content area features a section titled 'News and Links Shared by Labex Korea Twitter' with a sub-date of 'April 27, 2010 · Leave a Comment'. To the left of this section is a large grid of various logos. To the right is a text block explaining the purpose of the links. Below this is another section titled 'PARTNER IN' with a logo for RDA.

**FRONT PAGE** ABOUT LABEX ADDRESS PARTNERS DOWNLOADS EDITOR

**Embrapa** Labex Korea

Brazil-Asia Cooperation in Agricultural Research

### News and Links Shared by Labex Korea Twitter

April 27, 2010 · Leave a Comment

See below a selection of links to news, articles, documents, etc, that appeared recently in the Labex Korea Twitter. If a subject is of your interest, just click in the hyperlink to open the corresponding page. You can follow Labex Korea on Twitter, by clicking [here](#). You can also register [here](#) to receive by e-mail alerts on new posts published by Labex Korea.

**Enjoy short, timely news shared during 18-26 April, 2010.**

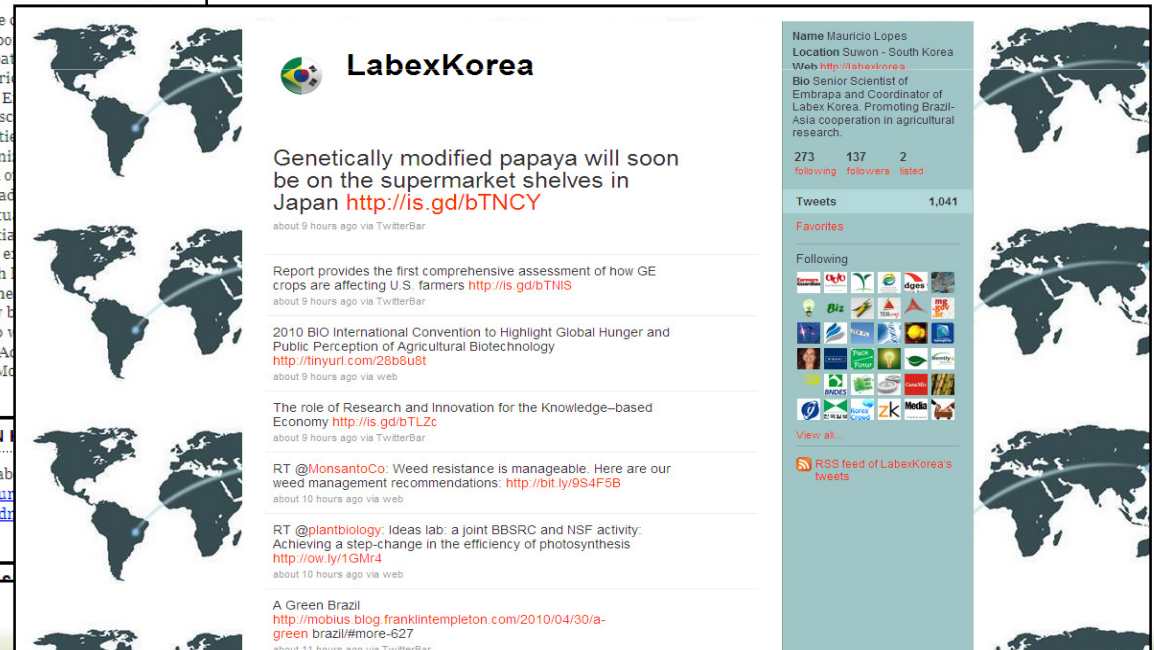
Brazilian Presence in the Korean Science and Technology Scene <http://is.gd/bJyUC>

Building a Green Economy <http://is.gd/bJyzQ>

**PARTNER IN**

RDA

<http://twitter.com/LabexKorea>



The screenshot shows the Twitter profile page for LabexKorea. The profile includes the name 'LabexKorea', location 'Suwon - South Korea', and bio 'Bio Senior Scientist of Embrapa and Coordinator of Labex Korea. Promoting Brazil-Asia cooperation in agricultural research.' The page shows 273 following, 137 followers, and 2 lists. The main content area displays several tweets, including one about genetically modified papaya in Japan, a report on GE crops affecting U.S. farmers, a convention on global hunger, the role of research and innovation for the knowledge-based economy, a tweet from MonsantoCo about weed resistance, and a tweet from plantbiology about a joint BBSRC and NSF activity. The right sidebar shows a grid of world maps and a list of accounts followed by LabexKorea.

**LabexKorea**

Genetically modified papaya will soon be on the supermarket shelves in Japan <http://is.gd/bTNCY>

Report provides the first comprehensive assessment of how GE crops are affecting U.S. farmers <http://is.gd/bTNIS>

2010 BIO International Convention to Highlight Global Hunger and Public Perception of Agricultural Biotechnology <http://tinyurl.com/28b8u8t>

The role of Research and innovation for the Knowledge-based Economy <http://is.gd/bTLZc>

RT @MonsantoCo: Weed resistance is manageable. Here are our weed management recommendations: <http://bit.ly/9S4F5B>

RT @plantbiology: Ideas lab: a joint BBSRC and NSF activity: Achieving a step-change in the efficiency of photosynthesis <http://ow.ly/1GMr4>

A Green Brazil <http://mobius.blog.frankintempleton.com/2010/04/30/a-green-brazil/#more-627>

Name Mauricio Lopes  
Location Suwon - South Korea  
Web <http://labexkorea>  
Bio Senior Scientist of Embrapa and Coordinator of Labex Korea. Promoting Brazil-Asia cooperation in agricultural research.

273 following 137 followers 2 lists

Tweets 1,041

Following

RSS feed of LabexKorea's tweets

# Thank You - 감사합니다

**Mauricio Antonio Lopes, PhD**  
**Brazilian Agricultural Research Corporation**  
**Embrapa Labex Korea**

[Mauricio.Lopes@embrapa.br](mailto:Mauricio.Lopes@embrapa.br)  
[Labex.Korea@ymail.com](mailto:Labex.Korea@ymail.com)  
[www.labexkorea.wordpress.com](http://www.labexkorea.wordpress.com)



