

# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY



Patents and Biotechnology  
accelerate the growth of  
Brazilian agriculture:

The Brazilian Agricultural Research Corporation (Embrapa)  
Innovation

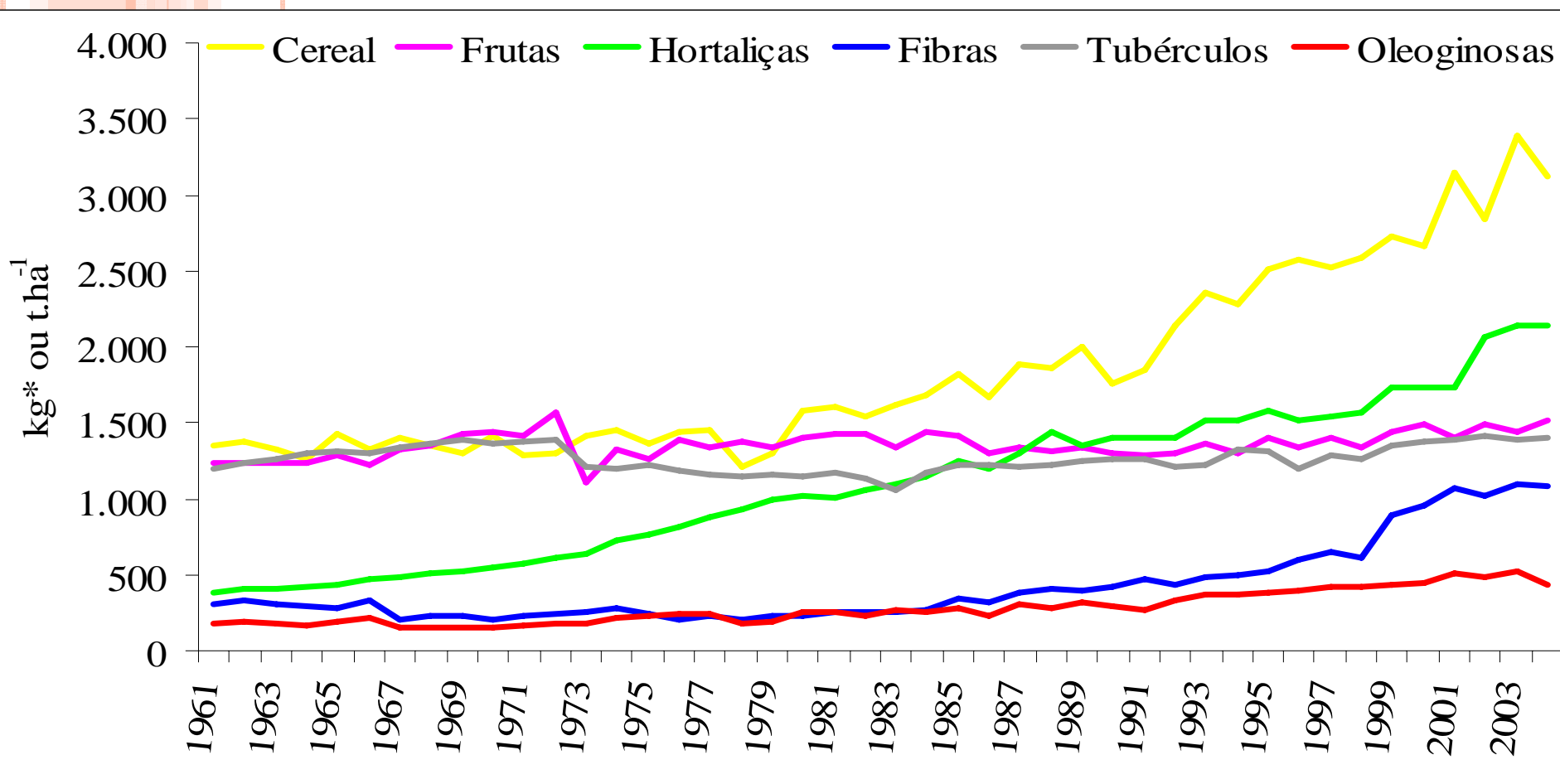
# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## The Brazilian Agriculture

- . Food Importer in the 70's
- . Currently the 2<sup>nd</sup> Food Exporter
- . Industrialization Process
- . Creation of Embrapa - April

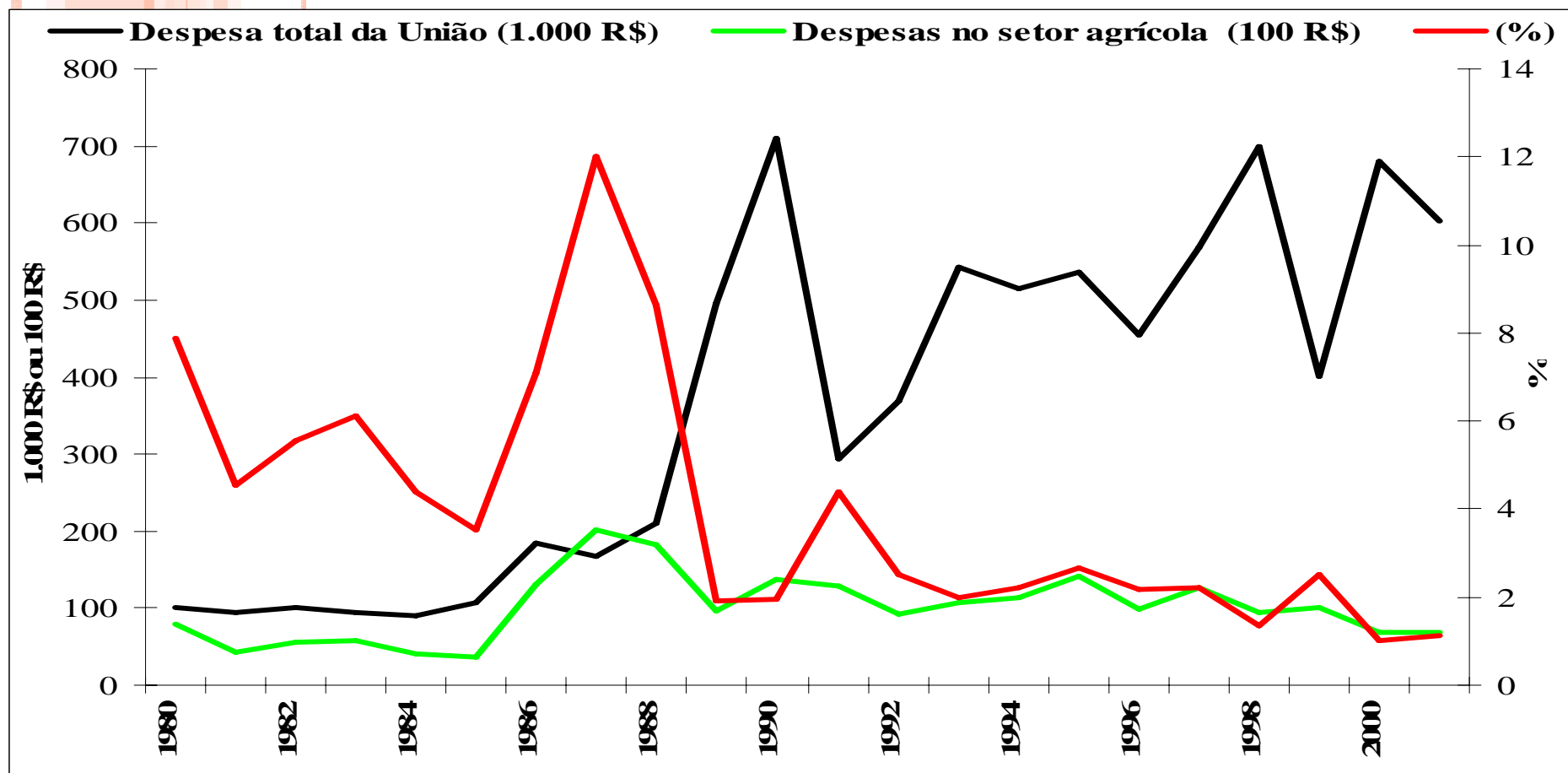
# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

Productivity gain – t/ha



# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## Government expenditures x agricultural expenditures



# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## Embrapa's Institutional Mission

To seek and implement sustainable development solutions for the rural space, focusing on Brazilian agribusiness, through the generation, adaptation and transfer of knowledge and technology, in order to benefit the whole Brazilian society

### . ANNUAL BUDGET

US\$ 700 million

### . FUNDING

Federal Government - 85%

Own Funding - 15%

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## Human Resources

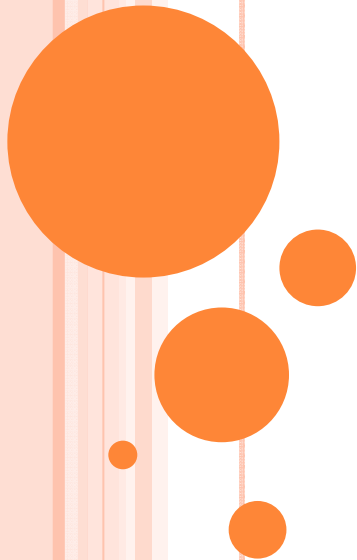
**Total employees: 8.600**

**Researchers: 2.300**

**53% PhD**

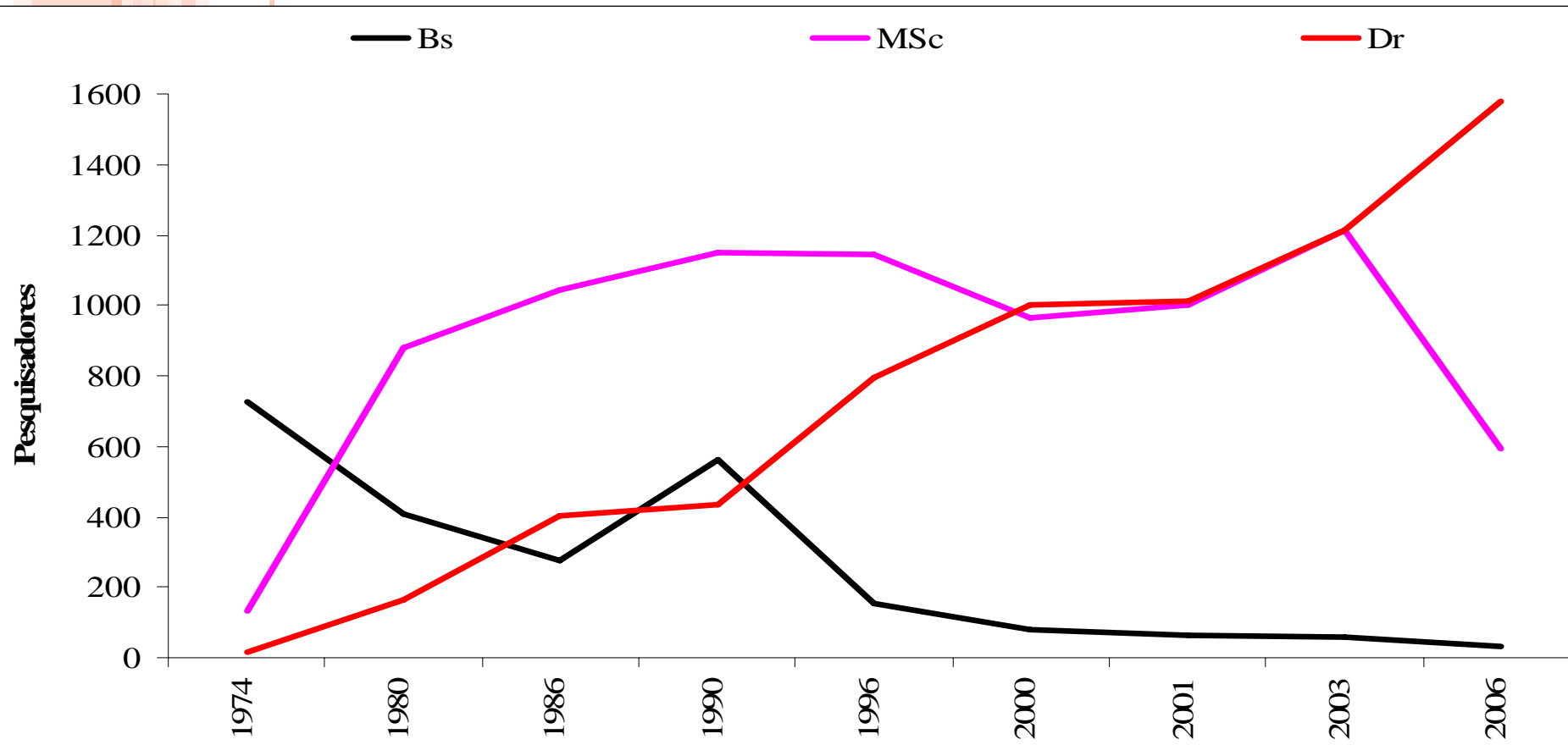
**45% MSc**

**2% BS**



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## Human Resources Evolution



# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## Research Network

- 39 Research Centers
  - 11 National Thematic Centers
  - 15 National Commodity Centers
  - 13 Ecorregional/Agroforestry Centers
- 03 Special Services
- Labex: USA – USDA/ARS
  - Europe: France, Netherlands
- Embrapa Africa – Accra, Ghana



# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## Embrapa's Innovation Network

### North

- ❖ Embrapa Acre
- ❖ Embrapa Amapa
- ❖ Embrapa Western Amazonia
- ❖ Embrapa Eastern Amazonia
- ❖ Embrapa Rondonia
- ❖ Embrapa Roraima

### Northeast

- ❖ Embrapa Mid-North
- ❖ Embrapa Tropical Semi-Arid
- ❖ Embrapa Coastal Tablelands
- Embrapa Goats
- Embrapa Cassava & Tropical Fruits
- Embrapa Cotton
- Embrapa Tropical Agroindustry

### Center-west

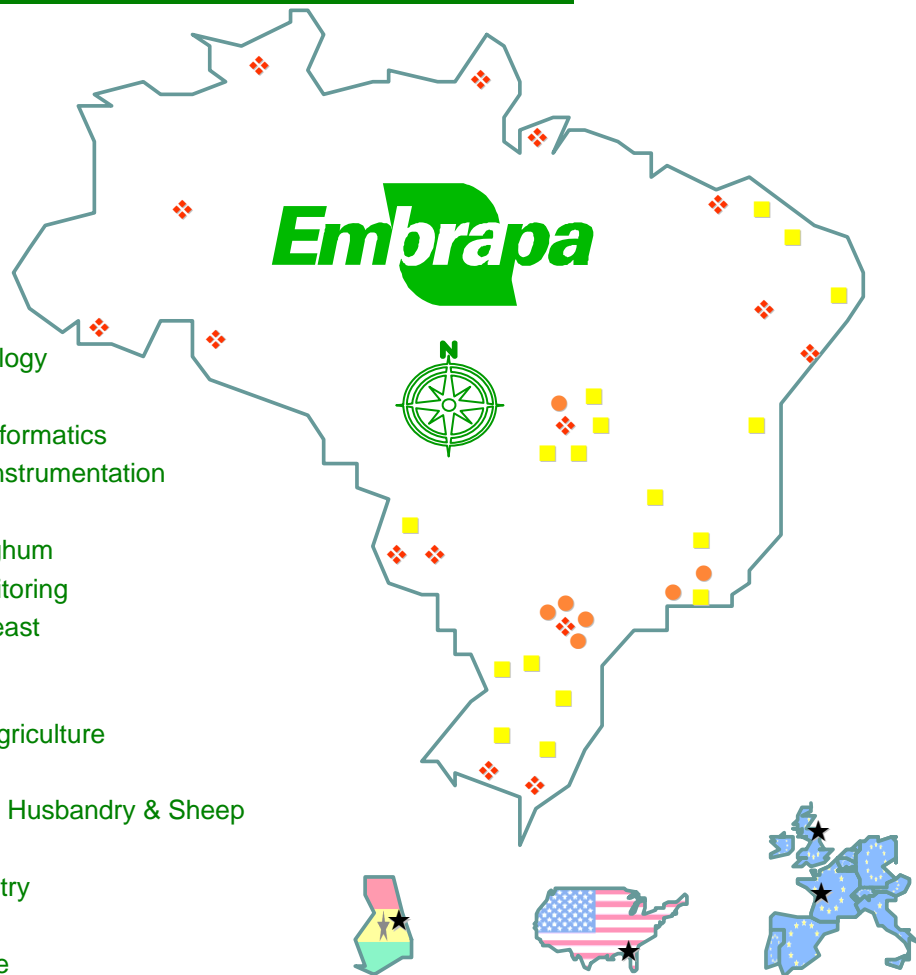
- ❖ Embrapa Western Region Agriculture
- Embrapa Rice & Beans
- Embrapa Coffee
- ❖ Embrapa Cerrados
- Embrapa Beef Cattle
- Embrapa Vegetables
- ❖ Embrapa Pantanal
- Embrapa Genetic Resources & Biotechnology
- Embrapa Technological Information

### Southeast

- Embrapa Agrobiology
- Embrapa Food Technology
- Embrapa Dairy Cattle
- Embrapa Agriculture Informatics
- Embrapa Agricultural Instrumentation
- Embrapa Environment
- Embrapa Maize & Sorghum
- Embrapa Satellite Monitoring
- ❖ Embrapa Cattle-Southeast
- Embrapa Soils

### South

- ❖ Embrapa Temperate Agriculture
- Embrapa Forestry
- ❖ Embrapa South Animal Husbandry & Sheep
- Embrapa Soybean
- Embrapa Swine & Poultry
- Embrapa Wheat
- Embrapa Grape & Wine



Embrapa Africa

Labex USA

Labex Europe

# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## NEW TARGETS

- Embrapa Agrienergy
- Embrapa Africa – Accra, Ghana
- Embrapa South America – Caracas, Venezuela
- Embrapa Central America, Panama City, Panama
- Labex Europe – Wageningen, Netherlands

# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## EMBRAPA AGRIENERGY

- Sugarcane: Ethanol, Bagace
- Pulp: Ethanol
- Oils and Fats: Biodiesel
- Cultivated Energetic Forests: Coal
- Residues and By-products: Biogas

# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## EMBRAPA AFRICA, SOUTH AND CENTRAL AMERICA

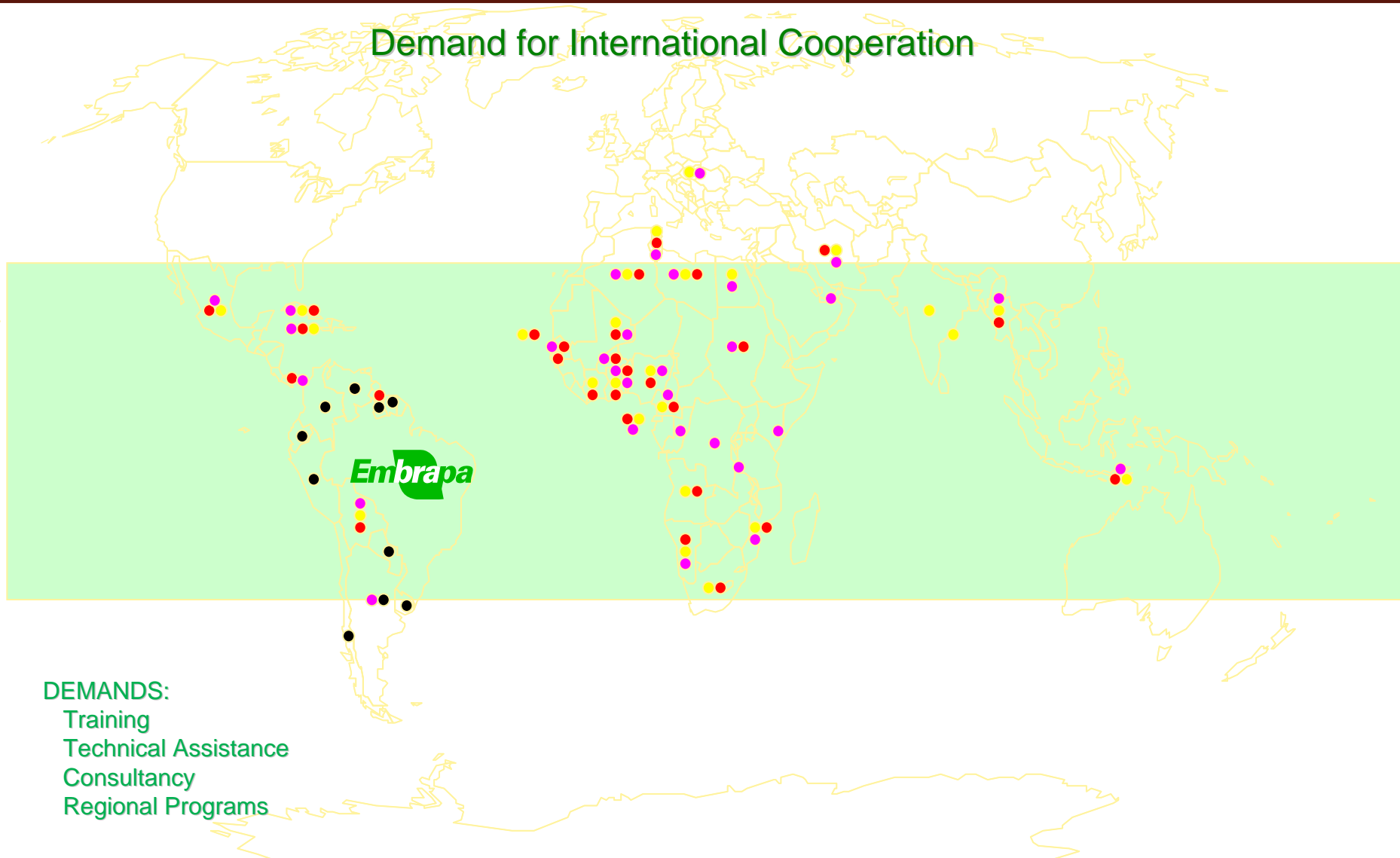
- Technology transfer
- Knowledge diffusion
- Agricultural and social-economic development
- Environmental sustainability
- Food, fiber and energy security

# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## Embrapa's International Cooperation

- **Bilateral Agreements: 71**
- **Number of Countries: 40**
- **Number of Institutions: 68**
- **Multilateral Agreements: 20 Int. Organizations**

# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY



# **PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY**



## **EMBRAPA'S BIOTECHNOLOGY CONTRIBUTION TO THE BRAZILIAN AGRIBUSINESS DEVELOPMENT**

# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## IMPROVEMENT AND UTILIZATION OF THE BRAZILIAN SAVANNAHS (CERRADOS)

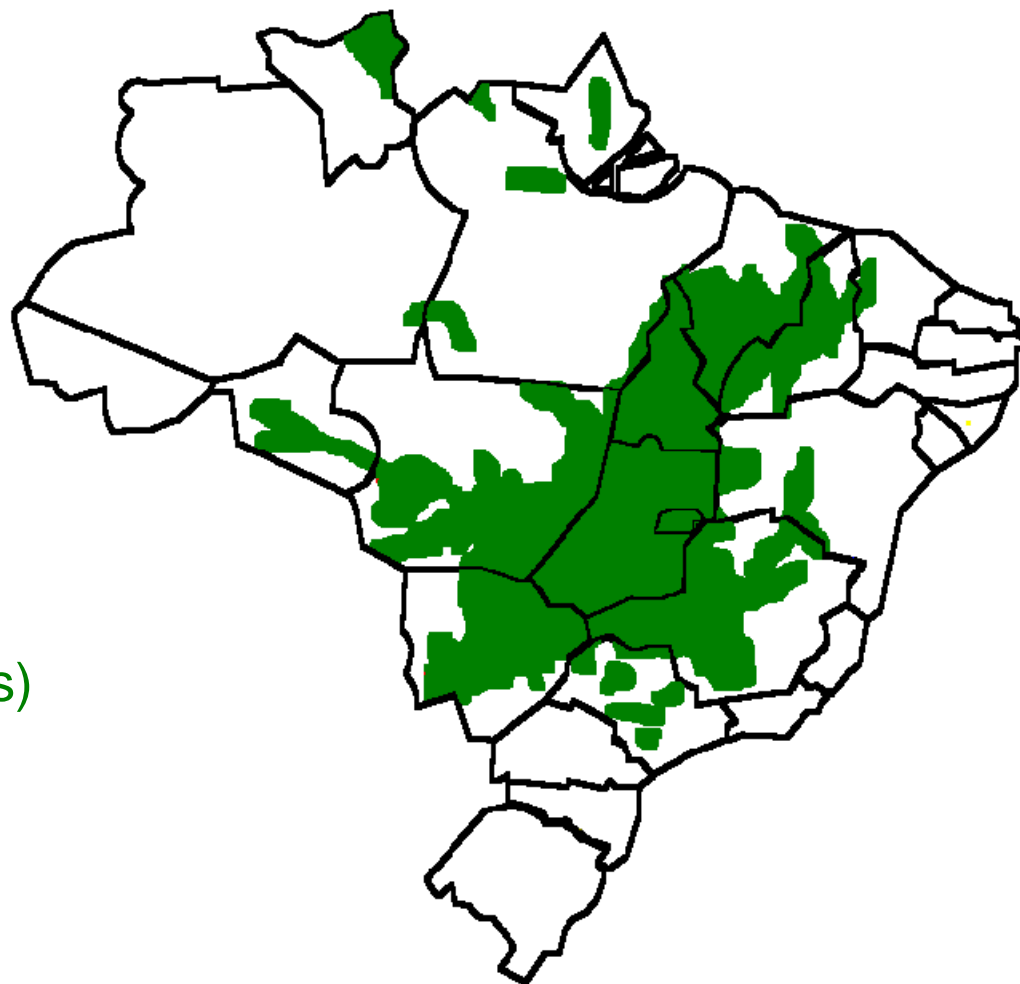
Production Area (millions ha)

Total Area 204

- Farming Area 127
- Cultivated pastures 35
- Annual crops 10
- Perennial crop and cultivated forests 2
- Area still available 80

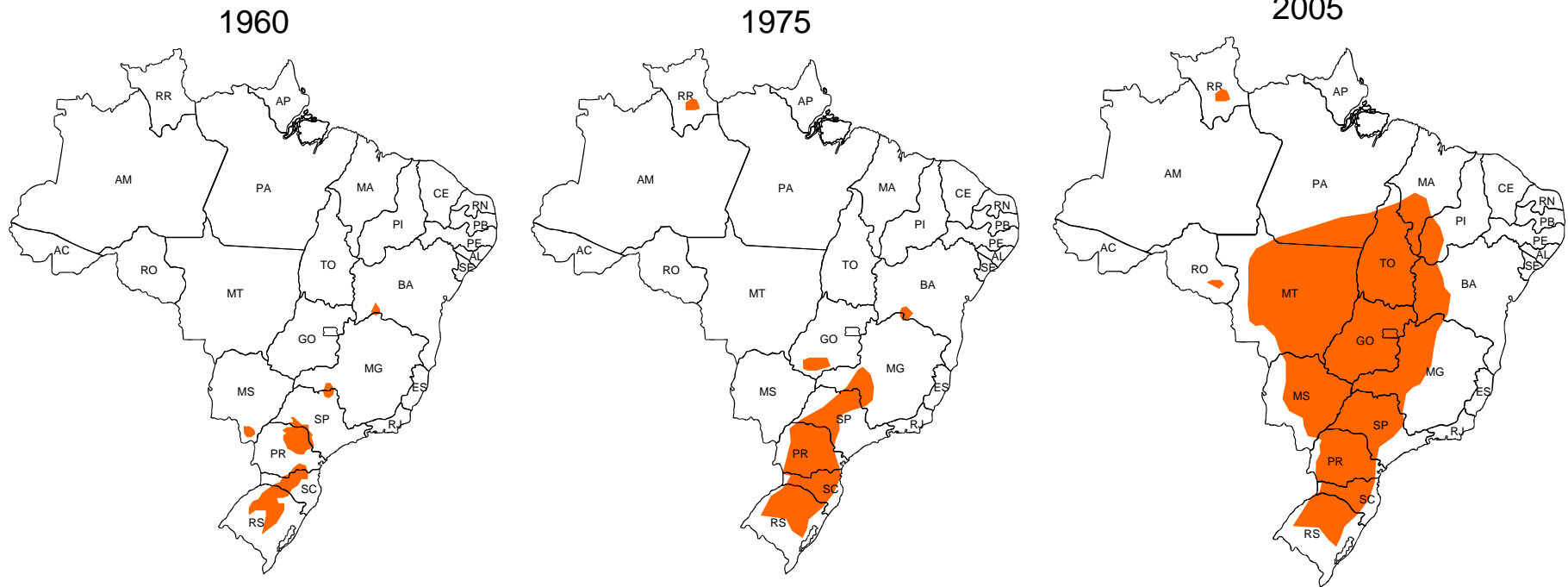
Potential production (millions tons)

- Grain 240
- Meat 11
- Fruit 90





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ADAPTATION OF PLANT VARIETIES  
NITROGEN BIOLOGICAL FIXATION  
NO TILLING  
PESTS & DISEASES BIOLOGICAL CONTROL

# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## BRAZILIAN “CERRADOS”

- 22% OF THE NATIONAL TERRITORY
- CONSIDERED USELESS IN THE 70's

Nowadays

- 50% OF GRAIN PRODUCTION
- 40% CATTLE
- ROTATION – 50% COTTON PRODUCTION

# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

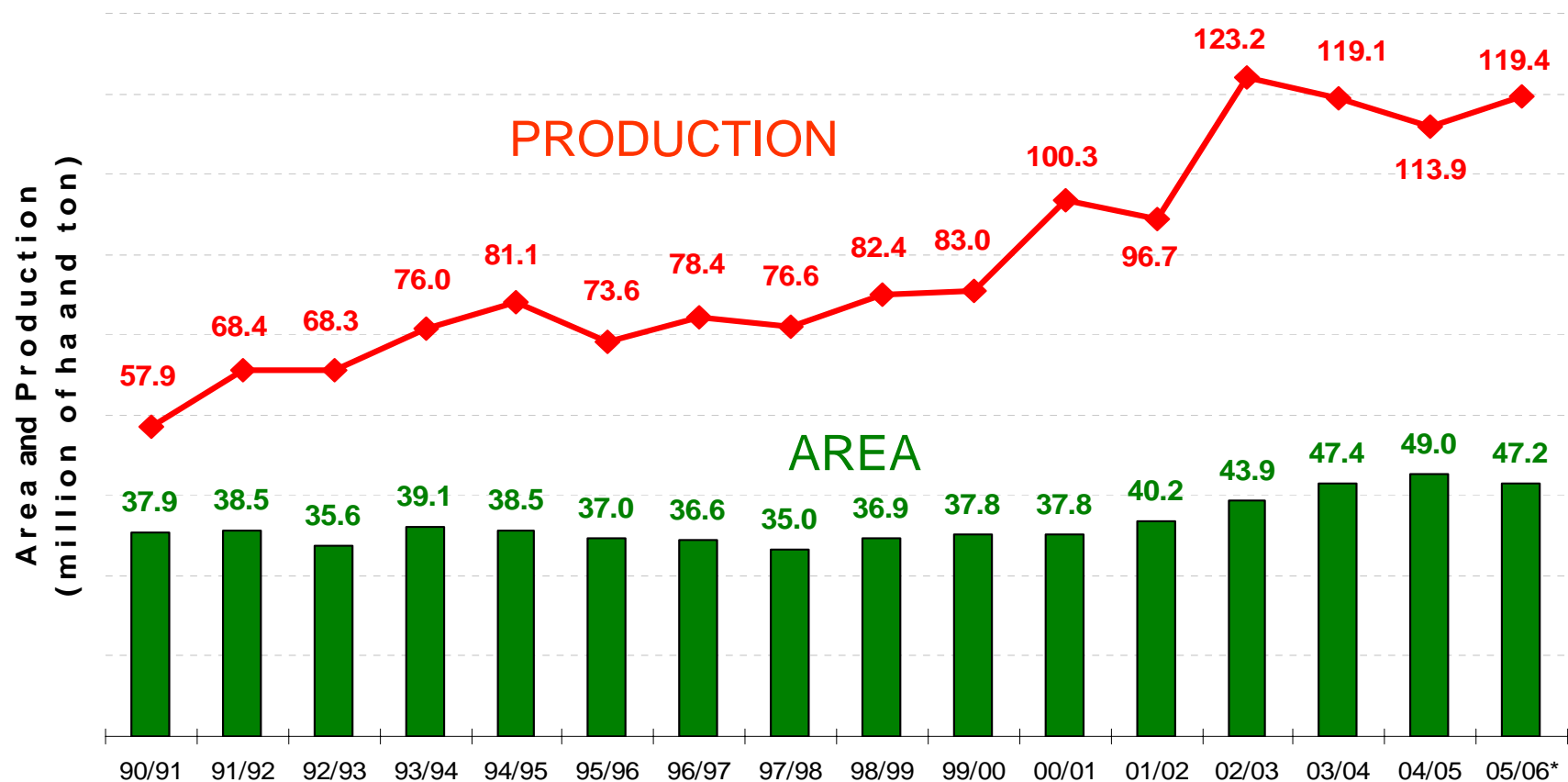
## BRAZIL: WORLD AGRICULTURAL PRODUCTION RANKING (2005 Harvest)

Products	Millions tons		Part. %	Ranking
	World (a)	Brazil (b)	(b/a)	
Coffee	7.7	2.1	27.8	1st
Sugarcane	1,293.2	421.8	32.6	1st
Orange	59.9	17.9	29.8	1st
Banana	72.5	6.7	9.2	2nd
Beef	60.4	8.8	14.5	2nd
Cassava	203.9	26.3	12.9	2nd
Soybeans	209.5	51.1	24.4	2nd
Tobacco	6.4	0.9	13.8	2nd
Poultry meat	70.0	9.2	13.1	3rd
Fruits	506.3	35.4	7.0	3rd
Corn	692.0	34.9	5.0	3rd
Swine meat	102.5	2.7	2.7	5th
Milk	527.8	23.3	4.4	7th
Eggs	64.3	1.6	2.5	7th
Rice	614.1	13.2	2.2	9th
Wheat	621.6	4.7	0.8	23rd

Source: FAO, IBGE, CNPC, ABEF and ABIPECS.

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## GRAIN PRODUCTION

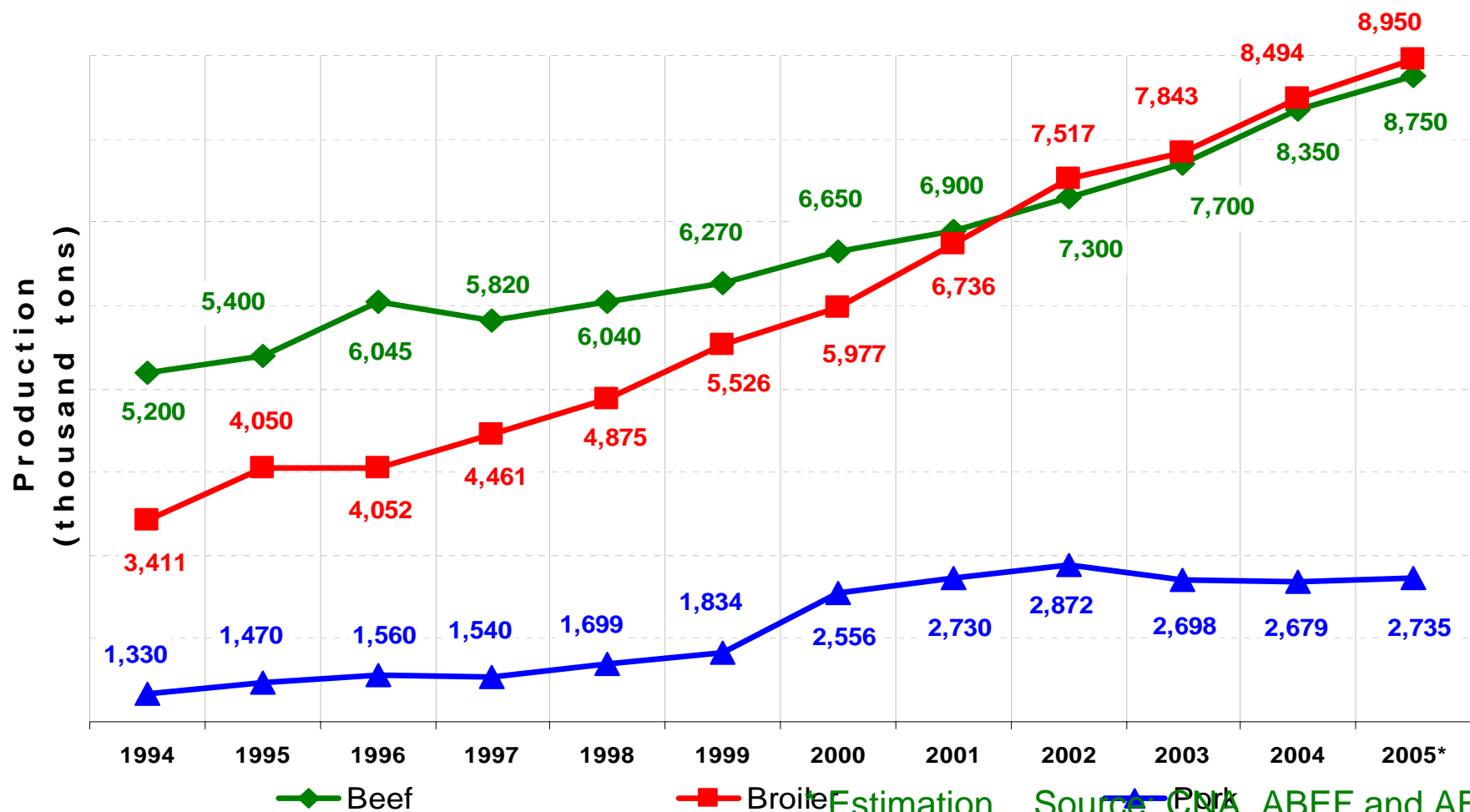


GRAINS: cotton, peanut, rice, oats, rye, barley, beans, sunflowers, castor bean, corn, soy, sorghum, wheat and triticale.

Source: CONAB / MAPA  
\* Estimation (8<sup>th</sup> harvest survey)

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## MEAT PRODUCTION

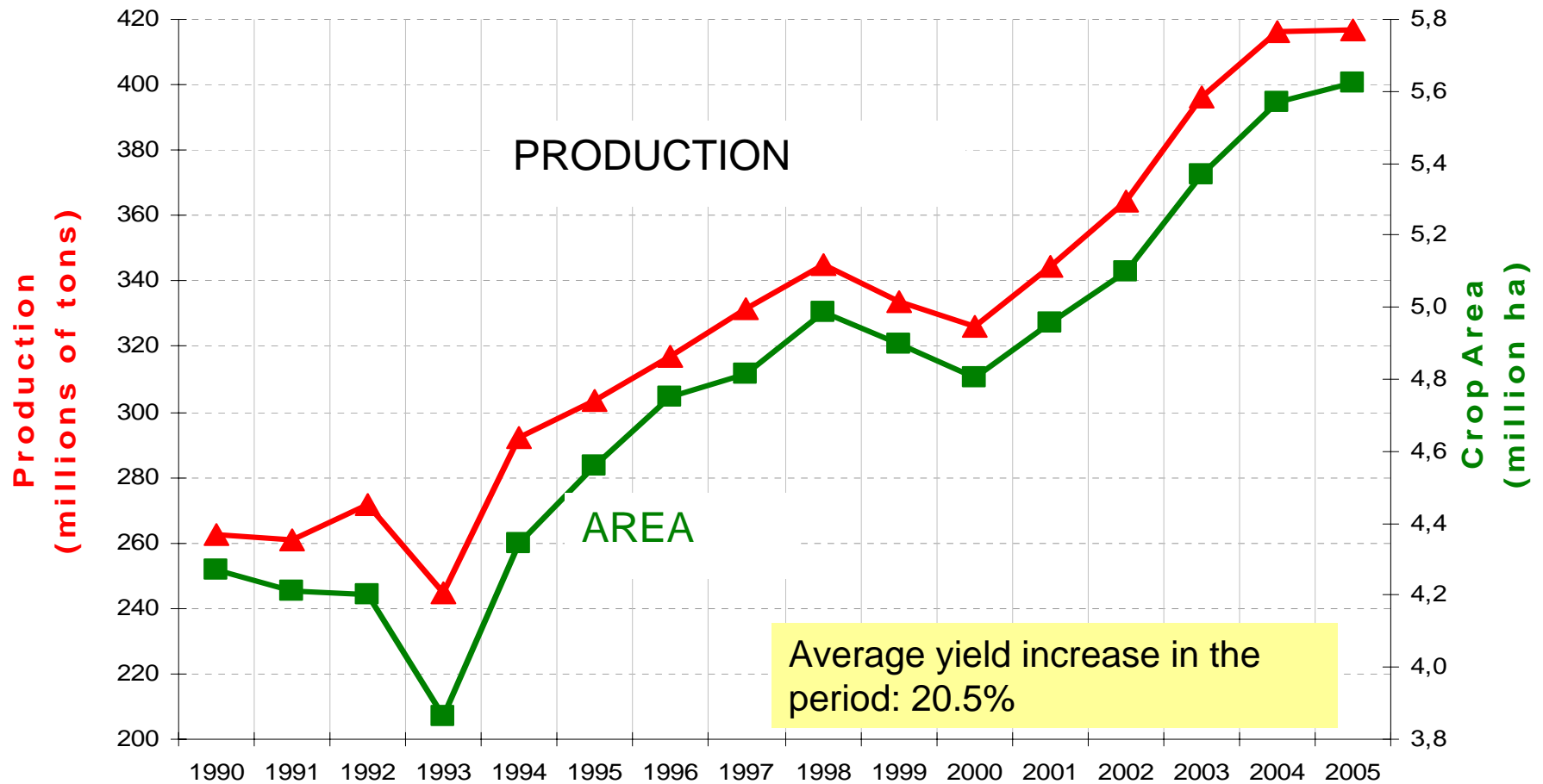


Estimation

Source: CNA, ABEF and ABIECS

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## Sugar Cane Production



Sources: IBGE (until 2003) and MAPA

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Ranking 2005: Production and Exports

Main products	Brazil - World Ranking	
	Production	Exports
<b>Ethanol *</b>	<b>1<sup>st</sup></b>	<b>1<sup>st</sup></b>
<b>Sugar</b>	<b>1<sup>st</sup></b>	<b>1<sup>st</sup></b>
<b>Coffee</b>	<b>1<sup>st</sup></b>	<b>1<sup>st</sup></b>
<b>Orange Juice</b>	<b>1<sup>st</sup></b>	<b>1<sup>st</sup></b>
<b>Soy Complex</b>	<b>2<sup>nd</sup></b>	<b>1<sup>st</sup></b>
<b>Beef</b>	<b>2<sup>nd</sup></b>	<b>1<sup>st</sup></b>
<b>Tabacco</b>	<b>2<sup>nd</sup></b>	<b>1<sup>st</sup></b>
<b>Broiler</b>	<b>3<sup>rd</sup></b>	<b>1<sup>st</sup></b>
<b>Corn</b>	<b>3<sup>rd</sup></b>	-
<b>Fruits</b>	<b>3<sup>rd</sup></b>	-
<b>Pork</b>	<b>4<sup>th</sup></b>	<b>4<sup>th</sup></b>

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## IP Role in Embrapa's Innovation

- Industrial Property Law – May 1996
- Plant Variety Law – April 1997
- Creation of SNT (96)
- Creation of IP Service (2000)
- Creation of Innovation Management Program (2007)



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## IP Role in Embrapa's Innovation

- From 1996 to 2006
  - 190 Patent Applications
  - 191 Trademarks
  - 297 Plant Varieties
  - 30 Software Programs

In the last 7 years 8 times more applications than in the 18 years before the IP policy and culture change

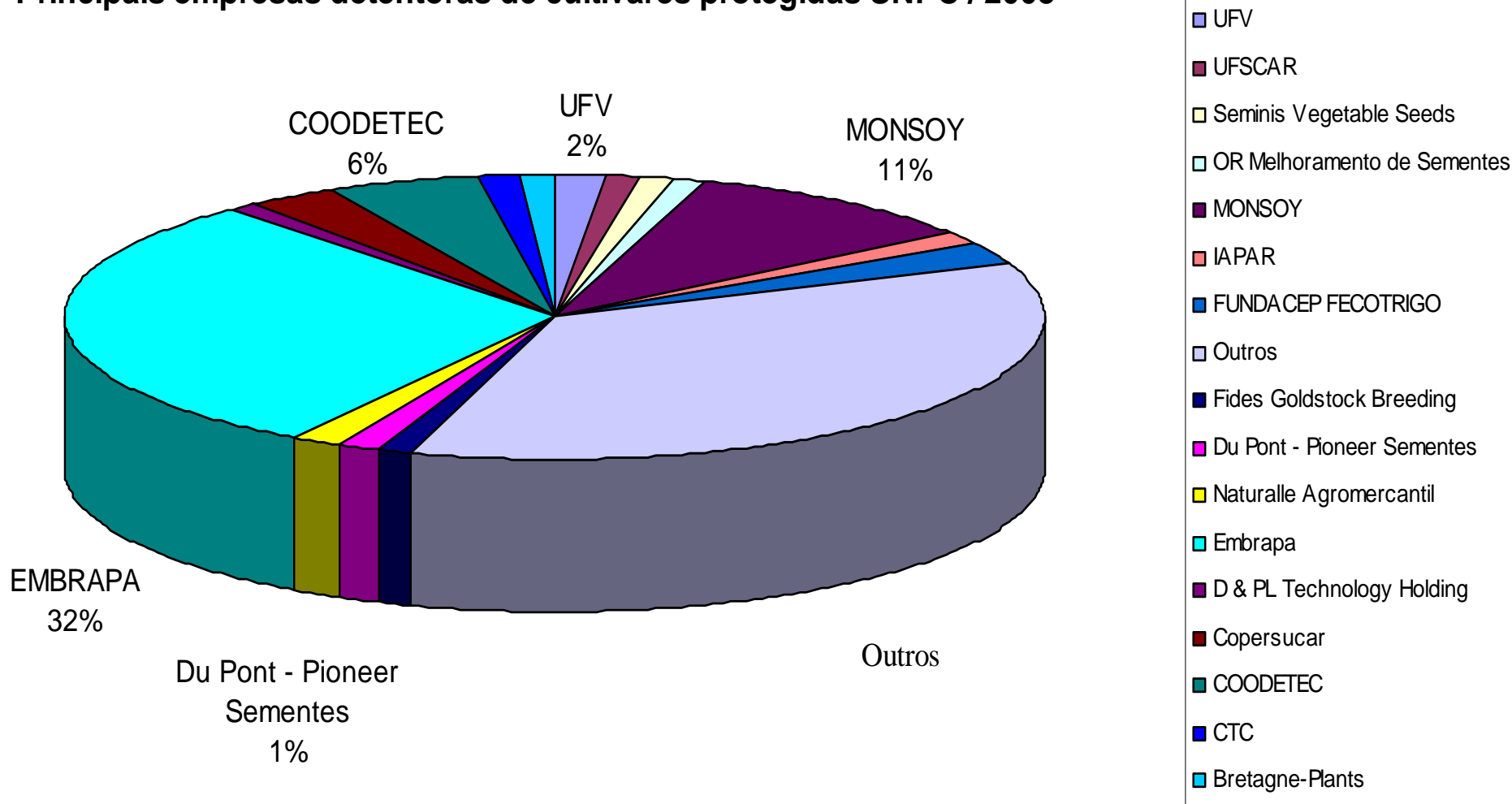
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## IP Role in Embrapa's Innovation

- 1400 License agreements
- 20 R&D Partnership programs
- National and multinational companies
- 1990 to 2007 - Grain production growth 131%  
Cultivated area growth 16%
- Commodity productivity per ha. – 1.5t to 2.8t

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Principais empresas detentoras de cultivares protegidas SNPC / 2008



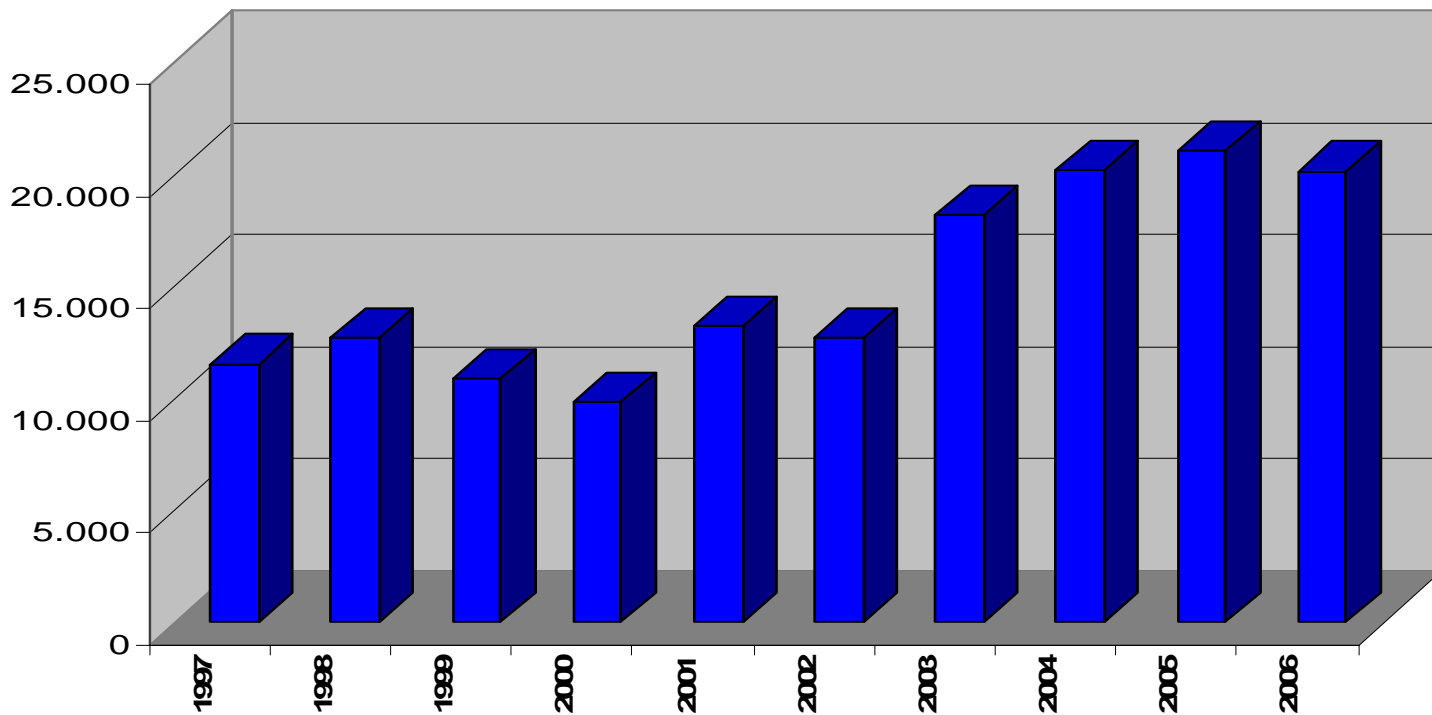
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2007 Royalties R\$ 23 million (15% growth)

2008 Royalties R\$ 32 million (39% growth)

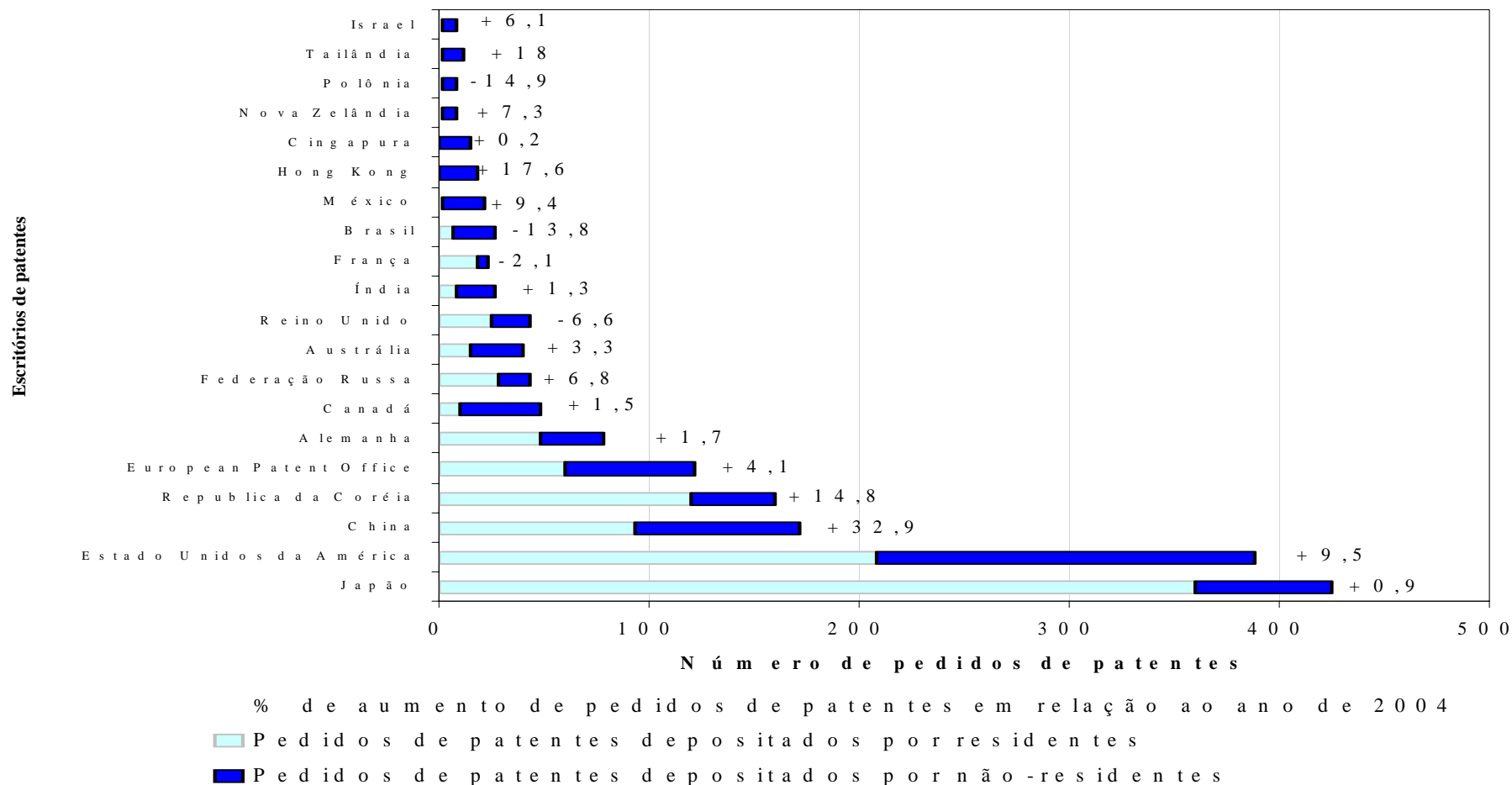
2008 Embrapa's Investment Resources R\$ 184 million

***Evolução da Arrecadação com Royalties e Sementes***  
(Em R\$ 1.000,00)



# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## IP and the Emerging Economies



# PERSPECTIVES ON BRAZIL'S NATIONAL INNOVATION SYSTEM AND THE ROLE OF PATENTS AND BIOTECHNOLOGY IN THE AGRO-INDUSTRY

## CONCLUSIONS

- Innovation made Brazil the 2<sup>nd</sup> global food exporter
- Agriculture is the key Brazilian trade factor
- Food and Energy are equally potential features
- Brazilian contribution to food security
- Functional Food trends and developments
- Leadership requires partnerships
- To be a global player requires innovation protection