Eco-Innovation Policies in Brazil

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Outline

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- ✓ **Institutional Arrangements**
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Brazil

A few numbers

Total area	8.5 million km²
Population	191 million
GDP (2010)	3,7 US$ trillion
Investment in R&D	1.25 % GDP in 2010
Scientists and researchers	231,000 in 2010 *(headcount)*
Scientific papers	2.7 % of world scientific production

Policy Framework

- Apart from recent initiatives on climate change issues, eco-innovation itself is not a goal in official innovation and technology policies
- The Brazilian government is mainly committed to increasing the country's competitiveness through innovation and technology efforts
- Economic reforms in the nineties towards export-oriented goals, privatization and trade and exchange rate liberalization prompted Brazilian firms to achieve substantial productivity gains
- However, the concepts of environmental sustainability and clean technology are being gradually and growingly internalized in the policy agenda

National Policy on Industry, Technology and Trade (PITCE)

2004 Innovation policy framework:

The National Policy on Industry, Technology and Trade (Política industrial, Tecnológica e de Comércio Exterior , PITCE)

- Consists of a set of 53 programs and instruments replacing a mix of programs and actions to deal with sectors lagging competitiveness
- Main objective is to increase competitiveness leading to growth and job creation by improving its technological performance and presence in global markets
- Regarding environmental issues, the PITCE explicitly gives emphasis to four areas:
  - Creation of a center for biotechnology research in the Amazon region;
  - Development of norms for certified forestry;
  - Development of biodiesel; and
  - Innovation in environmentally sound technologies

Productive Development Project (PDP)

2008 Innovation policy framework:

The Productive Development Policy (Política de Desenvolvimento Produtivo, PDP)

- It was launched aiming to enhance Brazilian competiveness by financing fixed capital and R&D, with annual credit incentives of about 40 billion dollars until 2010, together with government procurement, technical assistance and regulation.

- Organized in four levels, namely:
  - Strategic Areas (nanotechnology, health, biotechnology, nuclear energy, etc)
  - Consolidating leadership (oil and gas, beef, avionics, ethanol, etc)
  - Strengthening competitiveness (agribusiness, cars, civil construction, biodiesel, etc)
  - Strategic Initiatives (small and medium enterprises, sustainable production, etc)

Bigger Brazil Plan (Brazil Maior)

2011 Innovation policy framework:

The Bigger Brazil Plan (Plano Brasil Maior)

- It was launched to continue PDP to enhance Brazilian competiveness by financing fixed capital and R&D where tax base rate reductions on industrial goods (about US$ 10 billion) are added to the PND credit incentives, government procurement, technical assistance and regulation measures.
- Brasil Maior also has the ambitious goal of increasing until 2014 the GDP investment share to 22.4% from the current 18.4% and R&D expenditure share to 0.90% from the current 0.59%
- For the first time, the policy framework recognizes
  - The need to use efficiently the natural resource basis;
  - Sustainable Development as one of the main strategic goals and
  - Sets an environmental related target aiming a reduction of energy intensity in the industrial sector by 9% until 2014 (to 137 to 150.7 tpe/R$ milion)

Other Instruments

Together with PITCE, PDP and Brasil Maior, other laws create economic incentives for R&D, such as:

- Sectoral Funds representing almost 15% of total R&D federal expenditures mainly focused on strategic development areas but cover environment-related areas, such as, the Amazon region, water resources, biofuels and biotechnology

- The Innovation Law that creates fiscal advantages and subventions for the financing of partnerships between private sector agents and between them and universities and research centers, including governmental ones (Law 10973/2004)

- The Asset Law that creates favorable fiscal incentives and depreciation schemes for R&D investments (Law 11196/2005)

Institutional Arrengements

- → Brazil has a solid and centralized system on Science &Technology under the Ministry of Science and Technology (MCT)
- → Low public funding share in OECD terms: 37% federal funds, 17% state funds and 46% private
- → Today about US$ 24 billion or 1.6% GDP (less than 1% in Defense) much lower than OECD and emerging economies
- → MCT acts and spends its budget mainly based on two major institutions (FINEP and CNPq, both created on the seventies) that finance a wide range of institutions and organizations.

Major Institutions

CNPq

❖ Funding priorities are on researchers and research centers through scholarship and grants based on academic merits and fostering institutional capacity

FINEP

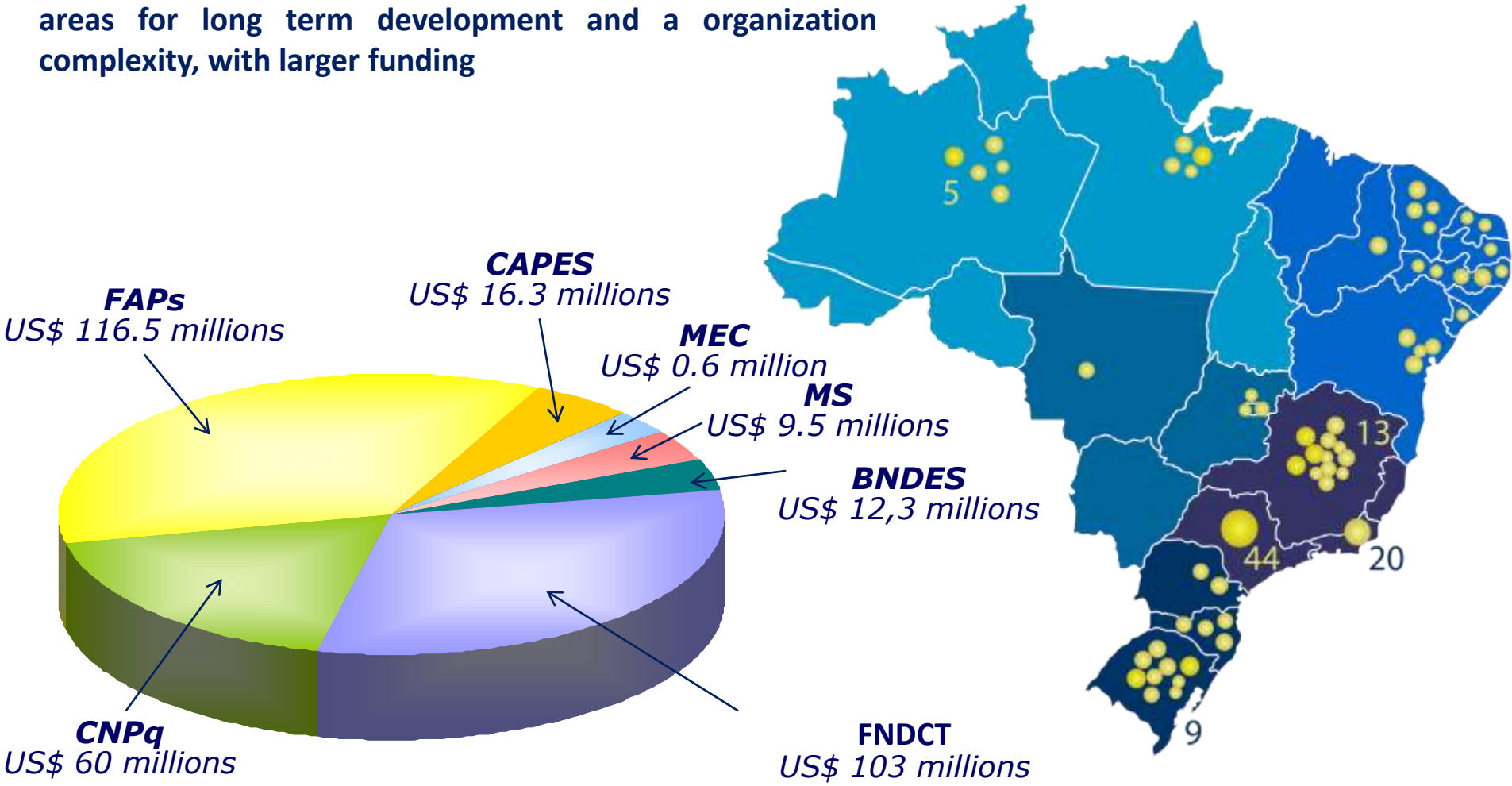
❖ Funds directed to firms through financing schemes to foster technology adoption and innovation in strategic sectors and areas and also to enhance the natural resource basis of the country.

❖ Specific funding schemes for biofuels and other renewable energies, biodiversity, water resources, fishery, semi-arid areas and tropical forest

❖ Both institutions manage funds on project basis to mitigate risks using fiscal and credit incentives with no power mechanisms

National Institutes of Science and Technology (INCT's)

The INCT's take an strategic role at the National Science and Technology System having both a focus in specific research areas for long term development and a organization complexity, with larger funding



Other Institutions and Programs

EMBRAPA

- Agricultural research institution promoting productivity in rural sector, focusing also on environmental matters, such as genetic development (major contributor to biomass productivity gains), organic practices, residues minimization and forest conservation

PROCEL

- Special federal program on energy conservation since 1986 with annual investments of US$ 62 million and estimated saving of 38.4 billion of kWh

PROINFA

- Specific federal program on renewable energies financing the production of 3 299 MW (50% from wind, 30% from small hydro plants and 20% from biomass) or about 3% of national production to be delivered with long-term contracts valuing US$ 6 billion.

- The Aeronautical Technical Center (CTA), the Large Scale Program on Biosphere and Atmosphere in the Amazon Forest (LBA) and Climate Change initiatives will be later discussed

Biotechnology Programs

- National Policy for the Development of Biotechnology in Brazil (Política Nacional de Desenvolvimento da Biotecnologia do Brasil) – 2007: Instituted the Biotechnology Comitee

- 24 Programs focused in Biotechnology (40 courses – Master and PhD) – about 1200 students by now.

- 37 undergraduate courses in Biotechnology in Brazil

  08 – Biochemical Engineering/Bioprocess

  06 – Biological Sciences with emphasis in Biotechnology

  23 – Bachelor in Biotechnology

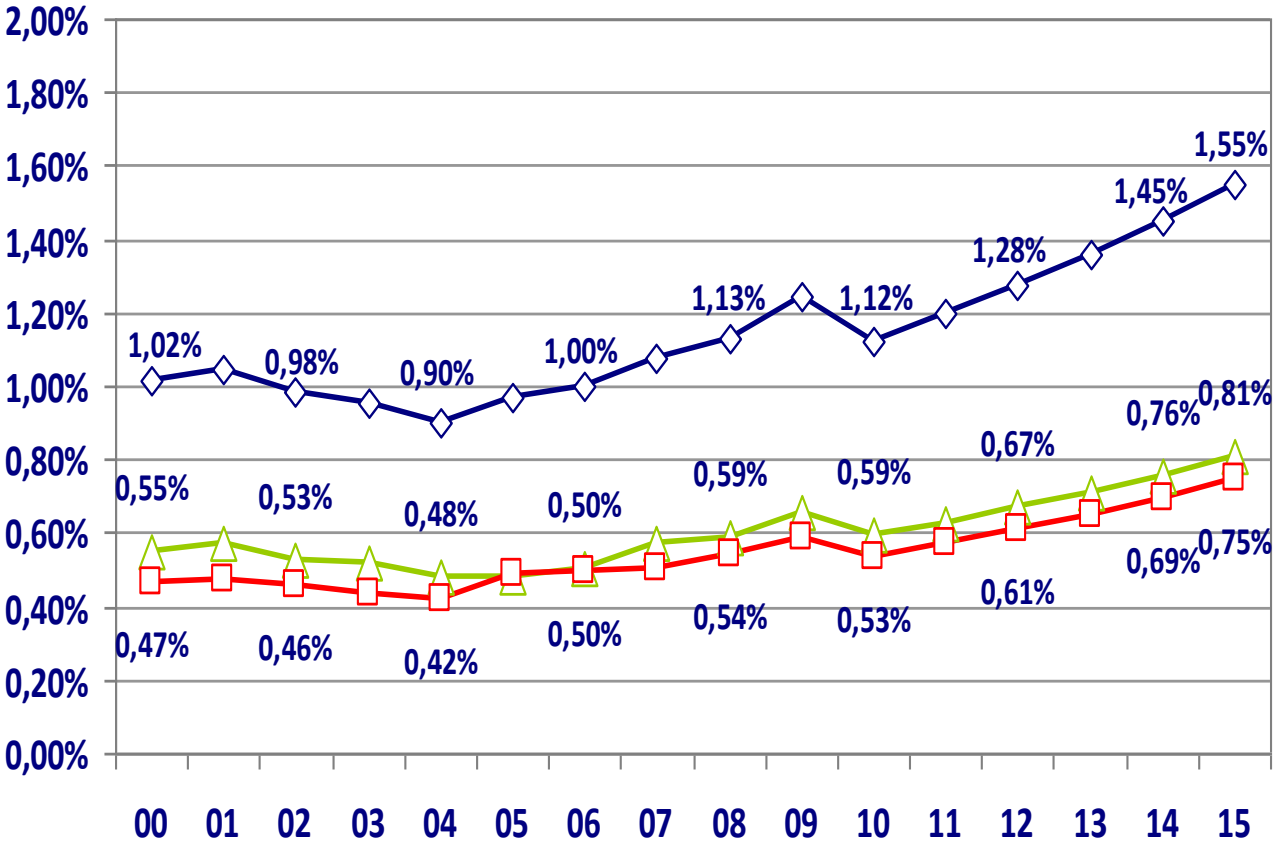
General Indicators

- CNPq effectiveness is high since its creation in the seventies
- Brazil's share in total articles published that are indexed to ISI, more than dubled in the last decade (from 1.29% in 1999 to 2.69% in 2009)
- FINEP's efforts have failed to generate impressive results and country's expenditures have not increased much in the last decades
- Only from 2005 onwards R&D expenditures to GDP ratio have increased to 1.19 in 2009 from 0.97 in 2005
- R&D expenditures related to environment are measured as Environmental Control and Protection and have been of less than 1% of total since 2000 (extremely lower than OECD level)

2015 Forecast

National R&D expenditure as GDP ratio (%)

2010 to 2015 estimates based on the
average annual percentage growth from 2004 to 2009



1. GDP estimates from 2010 to 2015 – Ministry of Finance;
2. R&D estimates from 2010 to 2015 based on the average annual growth from 2004 to 2009

Studies on Innovation

Negri & Lemos (2008): firms receiving official funds invested 54 to 104% more than others.

Xavier, Allencar and Cunha (2008):

(i) Brazilian exports intensive in R&D grown have increased their market share to 0.6 in 2005 from to 0.3 in 1998 led by aviation and telecommunications; and

(ii) Despite this increase Brazil´s share is still a third of Mexico´s and 20% of South Korea´s.

Campos and Ruiz (2009): cluster analysis showed that environmental impact reduction is one of the main motivation for industrial technological pathways only below product improvement and client reqirement and equally important as cost reduction, new markets and new regulation

PINTEC Database

- PINTEC is a R&D survey on industrial firms undertaken by the Brazilian Statistical Office, IBGE) indicates in the table below that:

- R&D consequences on environment performance have decreased from 2005 to 2003

- And they are much less relevant than other impacts, such as the 40-50% related to competitiveness and product differentiation

Impacts	2003 (%)	2005 (%)
energy saving	17	5
water conservation	16	3
pollution control	45	21

Environmental Compliance Studies

- Ferraz and Seroa da Motta (2002) with a 1998 survey on São Paulo industrial firms (CAEP), and Seroa da Motta (2006) with a 1998 sample of Brazil's industrial firms, analyze environmental investment decisions of Brazilian firm´s (input substitution, waste management and clean processes, etc)

- Both showed that size and international ownership are the major determinants and that gains with export sales have an equivalent weight that the domestic regulation

Case 1

The Amazon Forest

- The Large Scale Program on Biosphere and Atmosphere in the Amazon (LBA) analyses biosphere-atmosphere interaction in the Amazon Forest and its hydrological cycles and resulting social-economic consequences

- Amazon Monitoring Program (Monitoramento da Floresta Amazônica Brasileira por Satélite - RODES) that has contributed to the declinig rate of deforestation in Brazil

Case 2

Climate Change

CDM

- The Clean Development Mechanism (CDM) motivated a variety of projects of energy conservation, biomass energy, methane recovery and waste management and the country's today capture 11% of the whole CDM market despite its clean energy matrix

- More than 60% of the projects are sponsored domestically showing that market mechanisms create incentives for endogenous technology-based initiatives

Case 3

Brazil's NAMAs

→ The National Fund for Climate Change (FNMC) that will finance with US$ 150 million in adaptation and mitigation actions with ecoinnovation basis

→ Low Carbon Agriculture Program (Programa para Redução da Emissão de Gases de Efeito Estufa na Agricultura- ABC) to promote deployment of technological innovation to reduce GHG emission in the agriculture and cattle raising activities with nearly one billion dollars to be granted with a low interest rate of 5.5 a. a. and payment schedule of 12 years (direct cropping to reduce fertilizer use; recovery of degraded pasture; integrated crop-livestock-forestry activities; planted forests; nitrogen biological fixation; and manure treatment)

Main Conclusions (1)

- Centralized system counting on two major R&D institutions (CNPq and FINEP) showed good results but not enough to match the ones reached by other emerging economies

- Innovation is also are sponsored by official agencies of agriculture, forestry and energy

- R&D investments have increased in the last decade showing the positive effects of policy changes and targeted sectors

- Federal public budget and private expenditures to R&D constant even in recession periods

- Brazil´s R&D expenditures and GDP ratio still lower, 1.25%, in international terms but it is expected to reach 1.55% until 2015

Main Conclusions (2)

- Reliance on cost plus instruments rather than in power incentives and incipient use of innovative financing instruments (e.g. bank loans, venture capital)

- R&D policies mainly committed to competitiveness but environmental conservation, clean technology and biotechnology are increasingly identified and targeted in the R&D policy agenda

- Studies show nature of the firms and international trade as relevant to motivate firms in Brazil to invest in eco-innovation

- Management of tropical forest, renewable energies and climate change mitigation are successful cases of eco-innovation in Brazil based on sound budgeting, good targeting and technology transfer

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