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Global Agricultural Information Network

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## **Brazil**

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### **Agricultural Research in Brazil**

**Report Categories:**

Agricultural Situation

Agriculture in the Economy

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**Report Highlights:**

Agriculture has always played a critical role in Brazil's economy, serving as a primary source of revenue and central generator of employment. As modernization and urbanization developed in Brazil, a need for agricultural research arose, and the Brazilian Agricultural Research Corporation (EMBRAPA) was created. EMBRAPA's mission is to increase Brazil's agricultural yield and food production to support population growth and to develop solutions for food supply crises that arose in many cities. This report explains the history of the research entity, research goals, international cooperation, and contains an annex of ongoing research projects.

## **History of the Brazilian Agricultural Research Corporation (EMBRAPA)**

Agriculture has always played a critical role in Brazil's economy, serving as a primary source of revenue and generator of employment. Historically, Brazilian agriculture was labor-based and benefited from Brazil's abundant land resources, but suffered from lack of technology. Until the 1940's, Brazil was a net food importer and did not export agricultural products in large volume, relying mainly on coffee and sugarcane for export.

Post-World War II, Brazil entered a period of import-substitution and industrialization, with government policies supporting strategies to protect domestic industries through high protective barriers. The modernization led to an urbanization process and the need to develop a capital intensive agricultural research program to cover the increasing gap of labor in the fields. In addition, rapid population growth and the increase of *per capita* income drove the demand for food, creating a space between what was needed and what was produced. The Brazilian Agricultural Research Corporation (EMBRAPA) was created with a mission to increase Brazil's agricultural yield and food production to support population growth and to develop solutions for the food supply crisis that affected many cities in Brazil.

The first statute of EMBRAPA entered into force on March 28, 1973, through Decree# 72,020 which set the following guidelines: "to promote, encourage, coordinate and implement research, envisioning the production of knowledge and technology to be employed in the national agricultural development". Although it is linked to the Brazilian Ministry of Agriculture, Livestock and Food Supply (MAPA), EMBRAPA has its own assets and maintains its administrative and financial autonomy.

The creation of EMBRAPA included a significant effort for building capacity by training researchers in several areas of expertise. The importance given by EMBRAPA on that matter is evidenced by the financial effort in seeking funding from several partners, including the International Bank for Reconstruction and Development (IBRD) and the Inter-American Development Bank (IDB). Equally important was the support given by international agencies such as the Inter-American Institute for Cooperation on Agriculture (IICA), the Food and Agriculture Organization of the United Nations (FAO) and the United States Agency for International Development (USAID).

Since 1961, the U.S. Government has worked in partnership with the Brazilian Government, through USAID, to promote development in areas such as education, health, agriculture, sanitation and to improve public administration. In the 1960s and 1970s, USAID promoted the exchange of Brazilian and American scientists to bring the most advanced techniques of cultivation to Brazil, according to information provided by its website. A project in Brazil called the "Special Program for Agricultural Research" (*Programa Especial de Pesquisa Agropecuaria - PEPA*) established partnerships between four land grant colleges in the United States (Purdue University, Ohio State University, University of Wisconsin and University of Arizona) with counterparts in Brazil. PEPA's purpose was to improve the technical capacity of agricultural research in Brazil, by raising the scientific level of researchers (through post-graduation courses). That is considered the "embryo" for what would later become EMBRAPA.

EMBRAPA's researchers promoted significant changes in Brazilian agriculture. Indeed, the Cerrado biome (see map below), once unsuitable for farming, was incorporated into productive agricultural land after EMBRAPA's top notch research on improving the edapho-climatic conditions in the region and correcting formerly degraded acid soils. The biome occupies 2.04 million km<sup>2</sup> or 23 percent of the country and represents nearly 50 percent of Brazil's grain production.

Supporting environmental preservation in the Amazon biome is another major task for the institution. EMBRAPA has steadily collaborated through development and transfer of technology in

agri-forestry systems, crop-livestock-forest integration under no-tillage, fisheries and aquaculture, forest management, and good agricultural practices.



Source: Secretariat for Social Communication, 2016

Currently, EMBRAPA is the main public institution at the federal level that comprises the National Agricultural Research System (*Sistema Nacional de Pesquisa Agropecuária*–SNPA). In addition to EMBRAPA, SNPA also includes state agricultural research organizations (*Organizações Estaduais de Pesquisa Agropecuária* – OEPAS), universities and national/state research institutes and other public and private organizations directly or indirectly linked to agricultural research activities.

### **Strategic Priorities and Key Macro-themes for Research, Development and Innovation (RD&I)**

In 2013, EMBRAPA released a system to produce and spread information called Agropensa. Its strategic vision for the future was registered in the document “*2014-2034: The Future Technological Development of Brazilian Agriculture.*” The document is a result of the collective construction obtained from analysis, seminars and panels with experts from EMBRAPA and partner institutions (national and international), in addition to representatives of the agricultural and livestock national productive chains. Agropensa is represented by three elements: “Trends Observation,” “Analysis and Studies,” and “Strategies.”

Under “Trends Observation,” Agropensa monitors trends in the domestic agricultural sector and abroad. The intention is to qualify the information and provide knowledge to contribute to decision-making on the technological development of agriculture and its sustainability, as well as on related matters; such as economy, marketing, agricultural policies, rural development and technological adoption. “Trends Observation” mobilizes a large knowledge network, including actors and agents of the agricultural sector in Brazil and abroad, EMBRAPA’s Central and Decentralized Units and the Virtual Labs Abroad (Labex).

The second element of Agropensa, “Analysis and Studies,” includes detailed analyzes of relevant topics, prioritized from trends and ideas collected to detect opportunities, challenges and barriers to be surpassed during the technological development process.

"Strategies" comprises the third element of Agropensa. From the knowledge obtained in the previous steps, the actors involved in innovation engage in an effort to design decision-making strategies that aim to achieve its mission.

The document provides information for the revision of EMBRAPA’s Master Plan and for its agenda priorities, as well as providing essential topics for programs of training and capacity building, in addition to planning, monitoring and evaluation of EMBRAPA’s production process.

In addition to Agropensa, EMBRAPA also considered the following drivers to analyze the future of Brazilian agriculture research: demographics, technology, politics, and society. As a result of this extensive work, EMBRAPA defined eight macro themes and three cross-cutting themes:

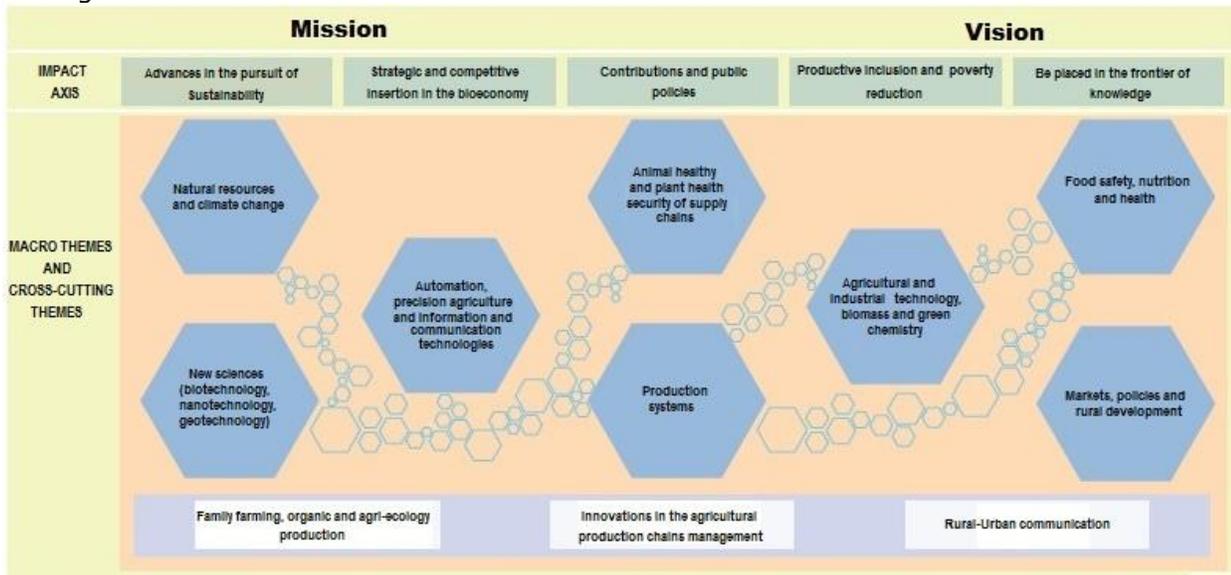
Macro themes:

1. Natural resources and climate change;
2. New sciences (biotechnology, nanotechnology and geotechnology);
3. Automation, precision agriculture, and information and communication technologies;
4. Animal healthy and plant health security of supply chains;
5. Production systems;
6. Agricultural and industrial technology, biomass, and green chemistry;
7. Food safety, nutrition, and health;
8. Markets, policies, and rural development.

Cross-cutting themes:

1. Family farming, organic, and agri-ecology production;
2. Innovations in the agricultural production chains management;
3. Rural-urban communication.

The figure below shows the interaction of the themes with EMBRAPA’s Vision and Mission.



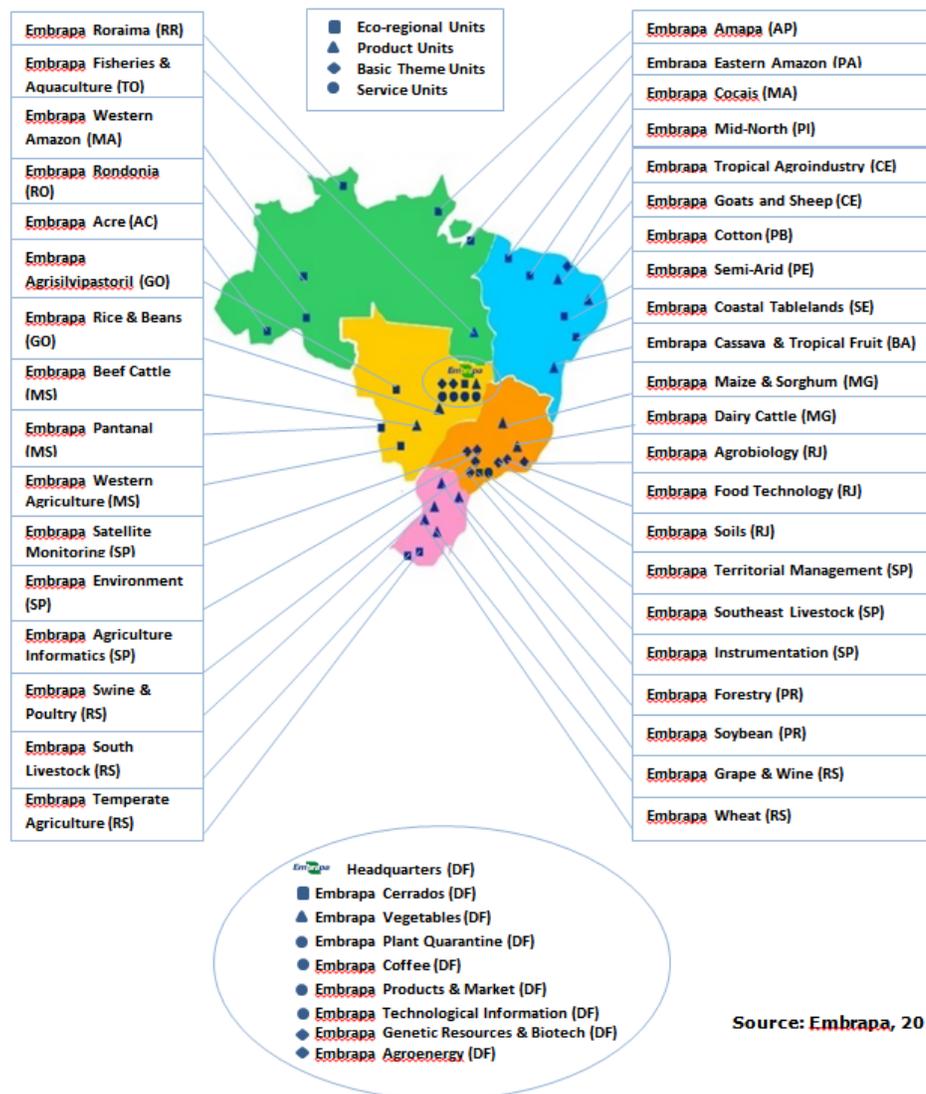
Source: EMBRAPA’s VI Director Plan, 2015

### Research Structure

EMBRAPA is overseen by an Administrative Council, which consists of eight members: two members nominated by MAPA, who work in agricultural research or agricultural science and technology (civil or government), three nominated from different federal ministries, one representative elected by EMBRAPA employees, the president of EMBRAPA, and the Minister of MAPA, who serves as the director of the council.

The institution's research model is based on a decentralized structure of specialized centers that focus their research within regional climates, biomes, and crops. The headquarters is in Brasilia and there are 46 research centers around the country. Those research units are called decentralized units (*Unidades Descentralizadas* – UD). UDs are divided in 17 eco-regional units, 14 product units, 10 basic theme units, and 5 service units (along with 16 offices). All are geographically represent in the map below.

The Administrative Council determines the agricultural research priorities of Brazil by advertising competitive calls for scientific projects. Interested EMBRAPA centers and their scientists can then submit proposals, which are evaluated based on human resources capacity and relevant research capabilities.



Source: Embrapa, 2016

### International Cooperation

Currently, EMBRAPA has 78 bilateral agreements with 56 countries and 89 foreign institutions. Its methodologies have also been shared with other countries facing challenges with food security and nutrition, like Mozambique. EMBRAPA has partnered with several universities worldwide. Good examples are the partnerships with the University of Florida and Michigan State University, with

support from USAID and the Brazilian Cooperation Agency (ABC), to promote food security and nutrition by strengthening policies for small-scale agriculture and school meals in Brazil.

The establishment of foreign laboratories (*Laboratorios no Exterior* – LABEX) in the United States (1998), France (2002), Ghana (2006), South Korea (2009), China (2012), Japan (forthcoming) and others are also part of EMBRAPA’s international knowledge network that supports continued technology transfer via the exchange of biological material, workshops, and training.

LABEX-USA is EMBRAPA's 'virtual' laboratory in the United States. EMBRAPA selects senior scientists from previously identified research focus areas to travel to the United States for short or long term durations and conduct research in collaboration with USDA’s Agricultural Research Service (ARS) staff at host laboratories. EMBRAPA funds the scientists' salaries and expenses while ARS provides office and laboratory space, equipment and supplies and scientific support (USDA-ARS, 2016).



(Source: EMBRAPA, 2016)

In 1976, 17 percent of EMBRAPA’s 1,300 researchers had postgraduate education and 3 percent held PhD degrees. EMBRAPA now employs 2,467 researchers (out of a total 9,396 employees). In 2010, 99 percent of the researchers postgraduate degrees, with 75 percent holding a PhD (54 percent of all PhDs obtained abroad). In 2015, EMBRAPA’s research budget was at R\$3 billion, up 7.1% compared 2014, demonstrating EMBRAPA will retain its position among Brazilian Government strategic goals.

MT	Mato Grosso
<b>Northeast</b>	
BA	Bahia
SE	Sergipe
AL	Alagoas
PE	Pernambuco
PB	Paraiba
RN	Rio Grande do Norte
CE	Ceara
PI	Piaui
MA	Maranhao
<b>North</b>	
TO	Tocantins
PA	Para
AP	Amapa
RR	Roraima
AM	Amazonas
RO	Rondonia
AC	Acre

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**Annex I. Brazilian States by Regions**



## Annex II. EMBRAPA's units and research lines

Research Centers and Offices	Research themes
<b>South</b>	
EMBRAPA Temperate Agriculture (Pelotas, RS)	Rice and fruit from temperate climate agri-ecosystems in Southern Brazil
Capao do Leao Office (Capao do Leao, RS)	Irrigated rice, onions, beans, wheat
EMBRAPA Southern Livestock (Bage, RS)	Milk and beef cattle, sheep breeding and forage crops in Southern Brazil
EMBRAPA Grape & Wine (Bento Goncalves, RS)	Sustainable viticulture and temperate climate fruits (apples, pears, stone fruits and small fruits)
EMBRAPA Wheat (Passo Fundo, RS)	Winter crops (wheat and others) and summer crops
Passo Fundo Office (Passo Fundo, RS)	Oats, rye, barley, rice, beans, corn, triticale, soybeans, wheat, grapes and pineapples
EMBRAPA Swine and Poultry (Concordia, SC)	Disease control, feed improvement, genetics, environmental preservation, development of equipment for swine and poultry
Canoinhas Office (Canoinhas, SC)	Potato, forestry, fruit trees, vegetables and medicinal plants
EMBRAPA Forestry (Colombo, PR)	Forestry sector

Ponta Grossa Office (Ponta Grossa, PR)	Oats, barley, beans, soybeans, corn, wheat and triticale
Londrina Office (Londrina, PR)	Soybeans, wheat and sunflower
EMBRAPA Soybeans (Londrina, PR)	Soybeans (genetic resistance to new diseases, studies to mitigate climate impacts)
<b>Southeast</b>	
EMBRAPA Territorial Management (Campinas, SP)	Territorial management
EMBRAPA Satellite Monitoring (Campinas, SP)	Research and geospatial innovations for agriculture, geoinformation and geotechnology
Campinas Office (Campinas, SP)	Forrage, banana, passion fruit, peach, pineapples and grapes
EMBRAPA Agriculture Informatics (Campinas, SP)	Bioinformatics, agrilimatology, software systems, scientific computing and communication technology
EMBRAPA Environment (Jaguariuna, SP)	Pesticides toxicology and environmental issues
EMBRAPA Instrumentation (Sao Carlos, SP)	Instrumentation technologies for agribusiness, such as machinery, equipment, sensors and process automation
EMBRAPA Southeast Livestock (Sao Carlos, SP)	Safety & quality of production, efficiency & sustainability of production (dairy and beef)
EMBRAPA Soils (Rio de Janeiro, RJ)	Tropical soils, preventive measures and prediction of environmental risks due to the inappropriate use of soil and water resources
EMBRAPA Food Technology (Rio de Janeiro, RJ)	Quality and food safety, value aggregation to raw materials and coproducts, post-harvest technologies
EMBRAPA Agribiology (Seropedica, RJ)	Soil biology, biological nitrogen fixation (BNF), organic agriculture
EMBRAPA Dairy Cattle (Juiz de Fora, MG)	Solutions for the sustainable development of the milk sector
Sete Lagoas Office (Sete Lagoas, MG)	Barley, fruit, corn, soybeans, sorghum and wheat
EMBRAPA Maize & Sorghum (Sete Lagoas, MG)	Development of cultivars (maize, sorghum and millet), soil science, plant nutrition, plant physiology, molecular biology, tissue culture, entomology, plant pathology and others
Triangulo Mineiro Office (Uberlandia, MG)	Forrage, soybeans, corn and sorghum
<b>Center-West</b>	
Goiania Office (Goiania, GO)	Upland rice, tropical irrigated rice, beans and soybeans
EMBRAPA Rice & Beans (Santo Antonio de Goias, GO)	Development of cultivars (rice and beans)

EMBRAPA Vegetables (Brasilia, DF)	Efficiency and competitiveness of the agribusiness of vegetables
Brasilia Office (Brasilia, DF) - Headquarters	Barley, fruit, corn, soybeans, sorghum and wheat
EMBRAPA Cerrados-Savannah (Brasilia, DF)	Ecoregional research to generate production system technologies for the Savannahs
EMBRAPA Genetic Resources and Biotechnology - CENARGEM (Brasilia, DF)	Genetics, biotechnology, molecular biology and biosecurity activities
EMBRAPA Plant Quarantine (Brasilia, DF)	Coordination and implementation of the exchange and quarantine of plant germplasm for the National Agricultural Research System - SNPA
EMBRAPA Technological Information (Brasilia, DF)	Bring scientific knowledge to society and technologies produced by EMBRAPA, with a printing industry, radio and TV studios, e-commerce system, large collections, databases and files
EMBRAPA Coffee (Brasilia, DF)	Coffee Research
EMBRAPA Products and Market (Brasilia, DF)	Actions for promotion, marketing and licensing of pre-technological assets developed by the plant and animal breeding program of EMBRAPA
EMBRAPA Agrienergy (Brasilia, DF)	Research, development and innovation in manufacturing processes, conservation and use of biomass energy or bioenergy
EMBRAPA Western Region Agriculture (Dourados, MS)	Crop-livestock-forestry integrated production systems, climate risk zoning, health and nutrition of aquatic organisms and aquaculture
Dourados Office (Dourados, MS)	Oats, forage, fruit, sunflower, soybeans and wheat
EMBRAPA Beef Cattle (Campo Grande, MS)	Health and nutrition, artificial selection, breeding and beef cattle management
EMBRAPA Pantanal-Wetlands (Corumba, MS)	Sustainability of agribusiness involving Pantanal (Wetlands) focused on livestock, aquaculture, fishing, family farming and environment
Rondonopolis Office (Rondonopolis, MT)	Rice, forage, soybeans, cotton and sorghum
EMBRAPA 'Agrisilvipastoril' (Agriculture, Forestry and Livestock integration) (Sinop, MS)	Crop-livestock-forestry integrated production systems, low carbon agriculture
<b>North</b>	
EMBRAPA Rondonia (Porto Velho, RO)	Coffee, crop production, forestry and animal husbandry

EMBRAPA Acre (Rio Branco, AC)	Forestry and sustainable livestock production, crop-livestock-forestry integrated systems, restoration of degraded areas, orcharding and agroindustrial native plants
Amazon Office (Manaus, AM)	Palm oil, "guarana", "acai" palm and banana
EMBRAPA Western Amazon (Manaus, AM)	Aquaculture, food and agribusiness, medicinal plants, olericulture, crop-livestock-forestry integrated systems and fruit production systems
EMBRAPA Roraima (Boa Vista, RR)	Family farming, indigenous agriculture and environmental sustainability
EMBRAPA Amapa (Macapa, AP)	Riparian, extractive, family agriculture and agrarian reform studies
EMBRAPA Eastern Amazon (Belem, PA)	Studies of Amazon plants and insects, entomology
EMBRAPA Fisheries and Aquaculture (Palmas, TO)	Aquaculture, fishery and crop-livestock-forestry integrated systems
<b>Northeast</b>	
EMBRAPA Cassava & Tropical Fruits (Cruz das Almas, BA)	Cassava, citrus, banana, pineapple, mango, papaya, passion fruit, "acerola", "umbu-caja" and close international cooperation with African countries
EMBRAPA Coastal Tablelands (Aracaju, SE)	Fruit, grains, vegetables, livestock, aquaculture, agrienergy, agri-ecology
EMBRAPA Semi-Arid (Petrolina, PE)	Production systems for dry areas, irrigation methods, family farming
Petrolina Office (Petrolina, PE)	Onion, cowpea, fruit trees, castor oil, corn and melon
Campina Grande Office (Campina Grande, PB)	Cotton, peanut, castor oil, sesame and sisal
EMBRAPA Cotton (Campina Grande, PB)	Cotton, castor oil, peanuts, sesame, sisal and <i>Jatropha curcas</i>
EMBRAPA Tropical Agrindustry (Fortaleza, CE)	Cashew nut and other tropical plants production systems
EMBRAPA Goats & Sheep (Sobral, CE)	Goats and sheep milk and beef production systems
EMBRAPA Mid-North (Teresina, PI)	Tropical plants production systems
EMBRAPA Cocais (Sao Luis, MA)	Tropical plants production systems and research on Flooding Plains biomes
Imperatriz Office (Imperatriz, MA)	Rice, corn and soybeans

### Post Contact and Further Information

Please do not hesitate to contact the offices below for questions or comments regarding this report or to request assistance to export agricultural products to Brazil:

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