



# BUSINESS PLAN FOR 2019 2019–2023 STRATEGY





# FOREWORD

This Business Plan presents Embrapa's goals and strategic results for 2019 as well as a long term strategy comprising guidelines for activities to be developed by Embrapa from 2019 to 2023.

Considering the characteristics and dynamic traits of research, development and innovation — the primary activity of Embrapa — this is an evolving paper, which must be enhanced as the processes in the institution undergo continuous cycles of development and improvement on its assets.

Since the beginning of 1990's, when, systematically, it has turned to a strategic planning to guide the course on its institutional evolution, Embrapa has assimilated the use of the technique of building scenarios so that to devise viable alternative futures in order to estimate which subjects and solutions would be required to support the development of the national agriculture. To produce this Business Plan, Embrapa has identified that, due to the technological intensification that it helped to build, productive contexts have become increasingly volatile, dynamic and complex, which, therefore, requires that the efforts to predict which sustainability challenges worldly changes will bring to Brazil as well as to its agriculture in the next years be accentuated.

Thus, the development of this Business Plan is based on the VI Embrapa's Master Plan, which was preceded by two years of studies and surveils, through which Embrapa has fostered a strategic intelligence system — Agropensa. This is due to the fact that the world we live in requires that we turn efforts to predict viable futures, and even the strategic planning itself, in systematic and lasting processes. To the next revision cycle in its planning, Embrapa has devised the paper *Vision 2030: the future of Brazilian Agriculture*, which conceives the starting point as well as scenarios required to Embrapa and its research centers planning.



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# INTRODUCTION

Brazilian Agricultural Research Corporation (Embrapa), affiliated to the Ministry of Agriculture, Livestock and Food Supply (Mapa), operates in the generation of knowledge and technology aiming at the production of food, fibers and sources of energy. The mission of Embrapa is to provide research, development, and innovation solutions for the sustainability of agriculture and for the benefit of Brazilian society. Working in accordance with the external environment, Embrapa's research is developed so that to meet the demands of the productive sector, to anticipate problems as well as to figure out new opportunities for the Brazilian agriculture.

The Business Plan is a tool proceeded from the strategy, of annual trait, that informs stakeholders how investment will be made throughout the year. In addition to contributing to strengthening the governance of Embrapa, the paper fulfills a requirement in law (Lei da Estatais, 13.303/2016) and is used in the assessment of the government performance index (Indicador de Governança), formulated by Secretaria de Coordenação e Governança das Empresas Estatais [a government instance to assess state-owned enterprises] from the Ministry of Planning, Budget and Management, the so called IGSEST.

Embrapa's Business Plan 2019 and Strategy 2019-2023 were supported by its VI Master Plan. The Master Plan was framed in 2014 concerning a long term span up to 2034, and it defines macro corporative goals established as objectives and strategic guidelines which, on its turn, channels the institutions' planning so that to respond to the challenges facing the Brazilian agriculture.

Still according to Law 13.303/2016, Embrapa's strategy shall be updated and shall be supported by risk analysis and opportunities for the next years. The Master Plan revision and the accomplishment of a new strategic plan are scheduled to 2019 and will be based on a prospective paper which brings up-to-date information and analysis on the future of the Brazilian agriculture, under the title *Visão 2030 – O futuro da agricultura brasileira* (Vision 2030 – The future of the Brazilian agriculture), released in 2018.

## VI EMBRAPA'S MASTER PLAN 2014-2034

The last Embrapa's Master Plan (VI PDE) was accomplished in 2014 concerning a long term span up to 2034. It is a brief document — as a plan on the strategic level must be — which carries the mission, vision and values of the institution, as well as map, objectives and strategic guidelines.

## Mission, Vision and Values

Embrapa is a dynamic institution, and its culture is consolidated over more than four decades. It is framed by professionals comprising different traits and skills, which, working in tune, complete themselves and their chores in the search for shared dreams and objectives. Here the Embrapa's Mission, Vision and Values are described. Such elements are part of Embrapa's identity and culture, a reflection on the way of thinking and the work of its employees.

### Mission

Provide research, development, and innovation solutions for the sustainability of agriculture and for the benefit of Brazilian society.

### Vision

Be a world reference in the generation and supply of information, knowledge, and technologies, and thus contribute to innovation and sustainability in agriculture and to food security.

### Values

The values that guide Embrapa and members' practices and conduct — irrespective of scenario —, and that represent the essential and enduring tenets of the company are:

**Table 1.** Embrapa's values.

<b>Commitment</b>	<b>Cooperation</b>
We work with engagement and responsibility to fulfill our activities.	We value team work, with collaboration and transdisciplinarity.
<b>Equality</b>	<b>Ethics</b>
We welcome and value differences in the pursuit of our goals.	We work for the greater good, with integrity and respect to others.
<b>Excellence</b>	<b>Social-environmental responsibility</b>
We are committed to our work and make efforts to deliver the best results with the highest quality.	We seek solutions that can return investments to society with due commitment to the environment.
<b>Flexibility</b>	<b>Transparency</b>
We adapt to change and seek creative solutions for agriculture's needs and challenges.	Our actions are based on publicity and information sharing aimed at open communication with stakeholders.



## Strategic Map

The strategic map synthesizes and visually represents strategic directions provided by Embrapa for a life span up to 2034, and is summarized in the mission, vision as well as in a comprehensive set of guidelines and leading objectives of the institutional performance. Such illustration aims at making the institution's communication and strategic management fluently, instances structured according to five perspectives: support for action, institutional management, RD&I, RD&I challenges and main impact.

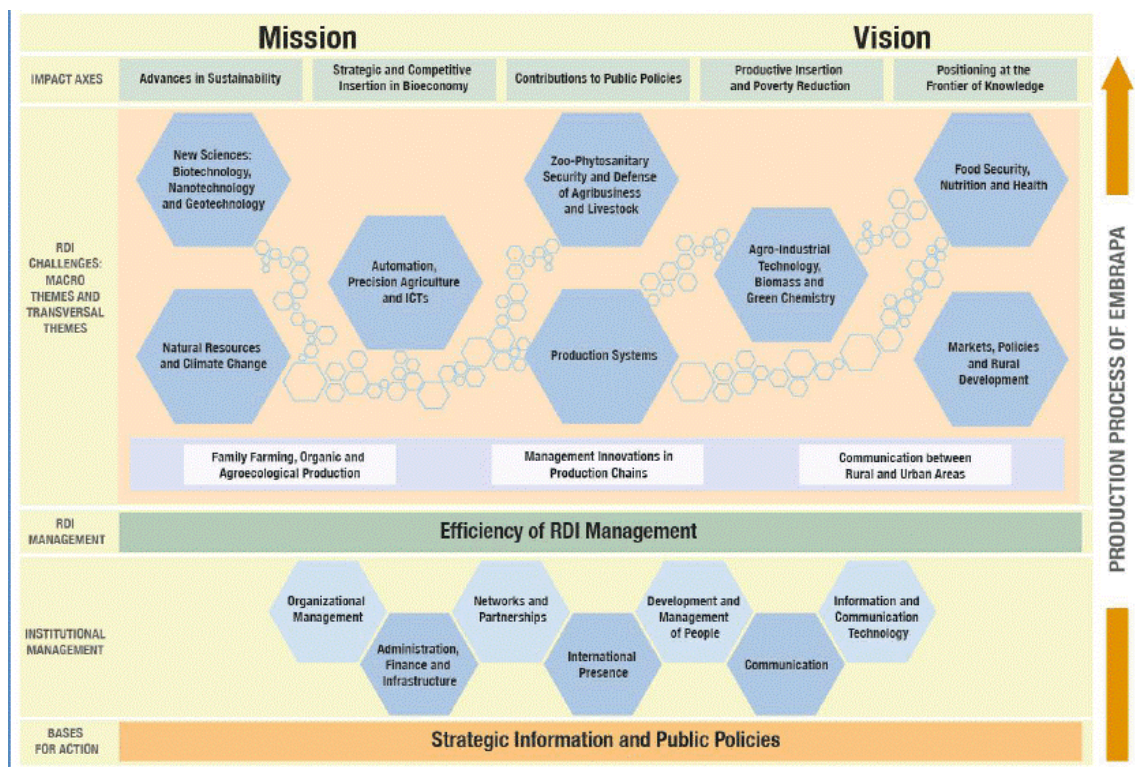


Figure 1. Strategic Map of Embrapa 2014-2034

The reasoning in the interpretation of the strategic map of the VI Master Plan follows those perspectives, orderly. The map represents the definition and integration of intelligence, management and execution efforts to make available relevant information and technological solutions to agriculture towards impacts and the vision established to 2034.

## Strategic Objectives

The strategic objectives establish the RD&I results that Embrapa aims to perform to accomplish its mission and to reach the devised vision for 2034. They are:

**Table 2.** Embrapa's strategic objectives.

1	To develop knowledge and technologies to the required management and sustainable use of the Brazilian biomes
2	To develop knowledge and technologies so that to enable solutions that increase the resilience and plasticity in native ecosystems and in agriculture production systems, as well as to amplify the ability of the agriculture to adapt to climate changes
3	To broaden common knowledge as well as the generation of assets that enhance development and the integration between agri-food and agro-industry systems of advanced solutions based on emerging science and technology
4	To develop, to adapt and to release knowledge and technologies on automation, precision agriculture and information and communication technologies so that to boost sustainability of productive systems and to add value products and process of agriculture
5	To broaden and strengthen RD&I on biological safety zoo/phyto-sanitary defense of agriculture [including livestock] as well as on Brazilian aquaculture and forest production
6	To develop innovative production systems that are able to increase agriculture, forest and aquaculture productivity, maintaining sustainability
7	To encourage knowledge improvement and technological solutions aiming to increase agriculture and livestock contributions so that to integrate food, nutrition and health
8	To create agriculture innovation assets supported by the use of biocomponents, raw materials, and technological routes [technology roadmaps] that help the development of new bioindustries aiming at renewable energy, sustainable chemistry and new materials
9	To support the improvement and the formulation of strategies as well as public policies, from analysis and studies aligned to the market and rural development needs
10	To generate knowledge and technologies and to suggest strategies, locally adapted, that contribute to the productive inclusion and to family farming
11	To generate knowledge and technologies that enhance management innovations to deal with efficiency, efficacy and effectiveness in the growing complexity and multifunctionality of agriculture
12	To develop and to launch information products and communication strategies that contribute to the enhancement of agricultural research as well as to increase the support of the society to the Brazilian agriculture

## Strategic Guidelines

In the attainment of its strategic goals and scope of the vision outlined for 2034, Embrapa produces management results as a support to the RD&I efforts, described in the following strategic and specific guidelines:

## Risks and Threats

Risks exist regardless of the attention we give to them. Whether in our daily lives or in the corporate world, we are immersed in an environment fraught with risks, op-

**Table 3.** Embrapa’s strategic guidelines.

1	To promote the continuous generation of accurate and useful information so that to guide RD&I strategies and contribute to public policies
2	To promote excellence in organizational management based on efficiency, efficacy and effectiveness
3	To improve administrative and financial management aiming at streamline and update organizational management
4	To increase efficiency in the RD&I management
5	To improve business network and relations with national partners
6	To boost the international presence of Embrapa.
7	To enhance and align continuously personnel management processes and policies to the organizational goals and objectives and to the future vision of Embrapa
8	To improve strategies and communication actions that stimulate RD&I process as well as the dialogue between the institution and the society
9	To enable solutions concerning Information and Communication Technologies (ICTs) so that to foster institutional development

portunities and threats that, if not measured, may compromise the attainment of the desired goals.

Embrapa operates in areas situated on the frontier of knowledge, in anticipation to changes in its environment. A great deal of Embrapa’s research results is due to a long process of development, which needs to be in tune with present and future demands from society and from the market. These are environments in which factors such as globalization, technology, restructuring, transition markets competition and regulations cause uncertainties.

The year of 2018 was a cornerstone because of the process of strengthening Risk Management in Embrapa. Secretariat for Institutional Development of Embrapa now has, since February 2018, a management instance dedicated to risks, integrity and transparency, made up of three areas — Transparency and Governance of Information, Risk Management, Compliance and Integrity Management —, expanding and strengthening work processes in this area. The institution established then a model of three lines of defense to enhance communication of risk management and control through the explanation of essential roles and responsibilities.

Notwithstanding Embrapa’s presence in settings with high potential of uncertainties, the risk of degradation and obsolescence as well as damages in the maintenance of deliverances of technological values to society and to all classes of farmers, which acquire from the institution support to keep the level of competitiveness of the agriculture and livestock sector, turn up as one of the main corporate risks directly linked to research activities. One of the causes is the recurring mitigation on the availability of resources to funding and investment in R&D, affecting the strategic objective of

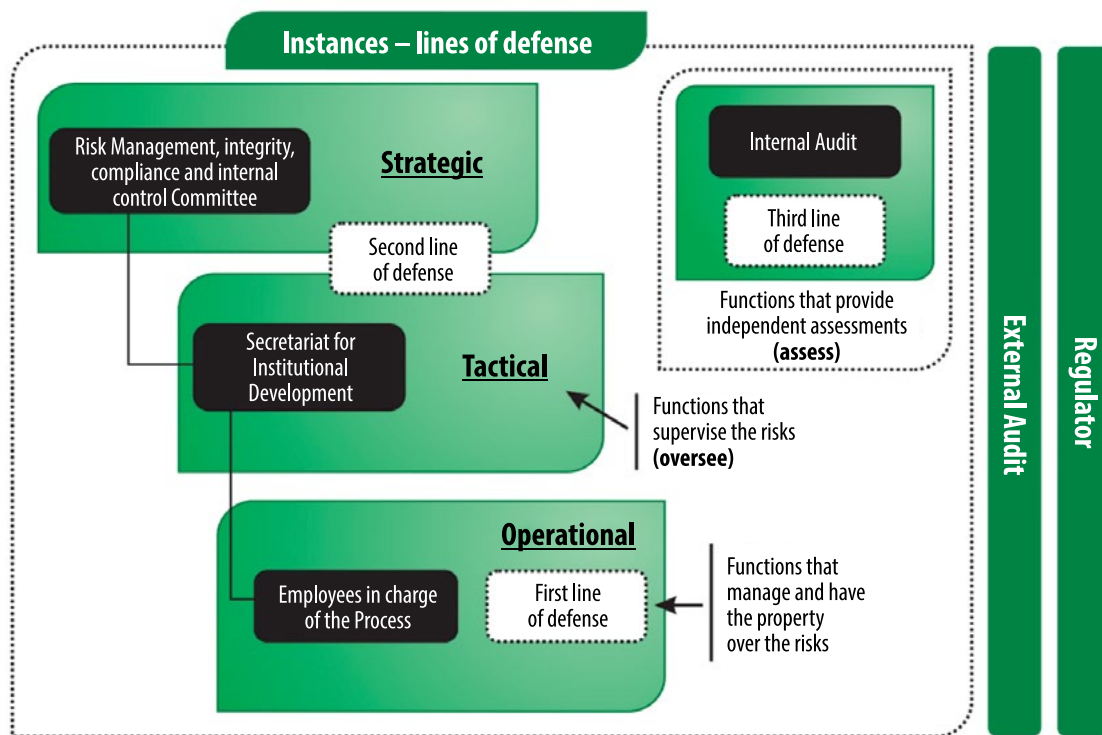


Figure 2. Risk Management policy – instances and lines of defense.

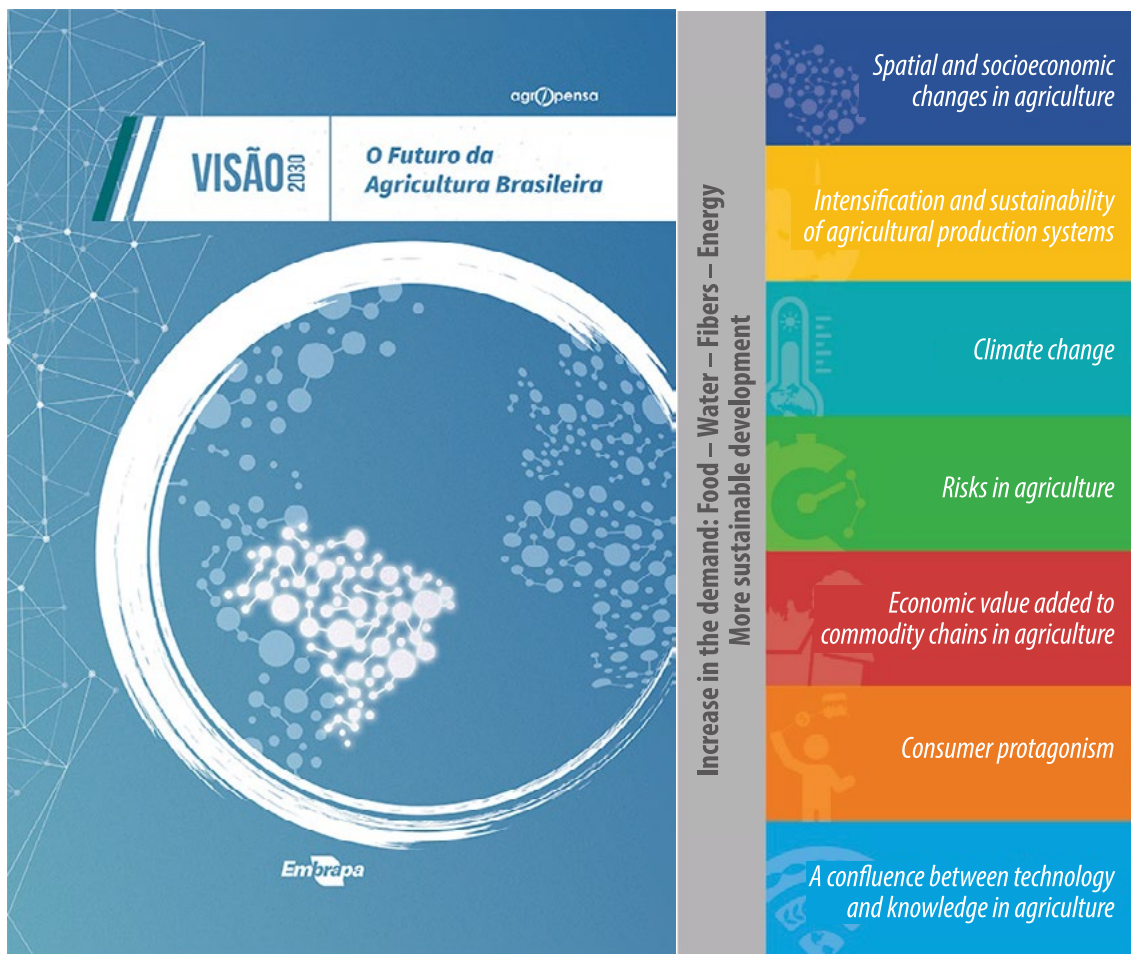
Innovation, with a noteworthy decreasing in the amount of started projects, yearly, as well as on the ability to maintain infrastructure installed (labs, experimental fields).

Besides, a current Embrapa's behavior analysis suggests a set of risks or threats which may endanger its performance and which require strategic action to cope with them appropriately in time and with assertiveness. Some of these risks are the following:

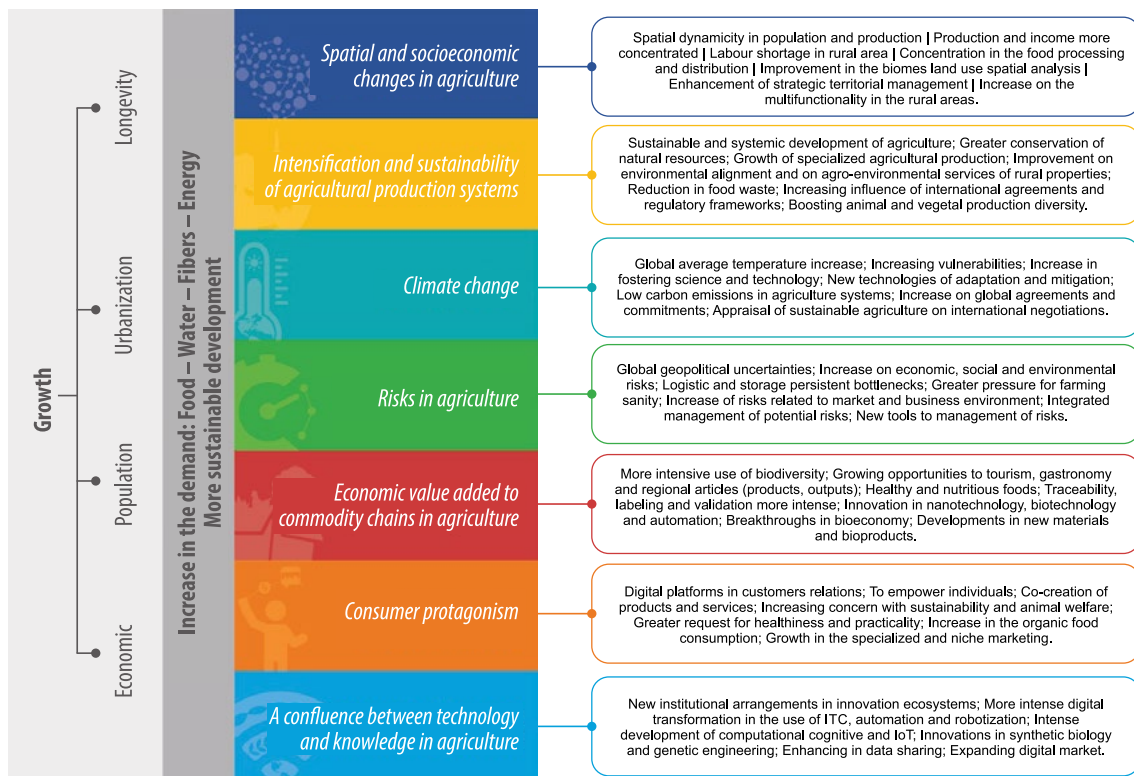
1. Embrapa's institutional immobilization as well as of other public institutions integrating the SNPA.
2. Lack of organizational capacity to respond to the demand growth.
3. Low commitment of farmers, of stakeholders and of the Brazilian society to the sustainable use of biodiversity.
4. Knowledge management ineffective.
5. Inadequacy of legislation concerning the preservation or the use of different Brazilian biomes.
6. Broadening of institutional difficulties as well as legal restrictions to research and to the establishment of partnerships.
7. Risk of evasion of the most talented professionals as well as of critical mass in strategic areas to Embrapa and to the country.
8. Technological risk inherent in research, development and innovation activities.

# VISION 2030 – THE FUTURE OF BRAZILIAN AGRICULTURE

Due to the dynamism and volatility of the productive reality and to the need for an ongoing process of construction, estimation, modulation and update in scenarios, in 2018 Embrapa has prepared a new forward-looking document presenting updated information and analysis, nominated *Visão 2030 – O futuro da agricultura brasileira* [Vision 2030 – the future of Brazilian agriculture]. In this document, the treatment and critical analysis of indications and trends achieved in the process of designing ‘the future of the Brazilian agriculture’ lead to the establishment of seven megatrends that will make up agricultural production chains. Besides, the study implies many subjects which shall be incorporated in the next cycle of planning and review that shall be concluded in its VII Master Plan (PDE).



**Figure 3.** Document Vision 2030 (to the left) and Megatrends (to the right).  
Source: Agropensa



**Figure 4.** The Future of the Brazilian Agriculture: main indications and trends in each megatrend.  
Source: Agropensa

## EMBRAPA'S RD&I PROJECTS – PORTFOLIOS AND BUSINESS AND INNOVATION STRATEGIC VIEW

### Organization of Embrapa's RD&I projects – Portfolios

Embrapa's RD&I management deals with a complex interaction of variables such as resource allocation, balance between risk and return, short and long term projects, incremental and radical innovation, prioritization, challenges and opportunities. Embrapa uses portfolios so that to organize its projects according to strategic themes. The purpose of this kind of organization of themes under portfolios is to move toward solutions in Research, Development and Innovation (RD&I) to the national demands and their interfaces with regional demands, regarding megatrends indicated to Brazilian agriculture as shaping forces of the future.

Portfolios are managerial support tools for the organization of projects into strategic themes. Their mission is to direct the production of research, development and innovation

(RD&I) solutions towards national demands and their interfaces with regional demands. For that purpose, they consider megatrends in Brazilian agriculture as well as forces modelling the future. Such tools have the aim of ensuring the continuous improvement of the research programming, to reduce redundancies, maximize the use of public funds and better coordinate efforts and skill sets. The portfolios are organized according to a thematic vision that originates both from a corporate standpoint (top-down) — with the purpose of finding solutions for national, institutional and government demands — and from Embrapa's Decentralized Units (bottom up) — with the aim of producing solutions for regional, biomes' or production chains' demands. Their RD&I priorities are organized as innovation challenges. The innovation challenges describe opportunities and demands from production chains in a way that is connected to Embrapa's strategic goals, within the scope of each portfolio theme.

With the aim of improving the planning of the research program, and monitor and reduce redundancies, in 2018 SPD promoted the reorganization of the corporation's RD&I project portfolios, with the purpose of strengthening them as planning and monitoring tools, connecting the RD&I program to corporate strategies and meeting societal expectations.

This rearrangement allowed to reposition, to merge, and to define new programmatic figures, which were rearranged in 34 new portfolios that comprises the corporation projects agenda. The rearrangement of Portfolios aims to strengthen the connection among RD&I projects and the needs in the productive sector, besides fostering the corporation's strategic targets improving therefore the management process and expanding results. Below are listed the new PD&I project portfolios into force since 2019.

**Irrigated agriculture** – The portfolio aims at optimizing and rationalizing water use, and increase its efficiency and productivity.

**Food safety, nutrition and health** – The portfolio's goal is to inform public policy that aims at the production and consumption of safe and nutritional foods, to benefit health and generate jobs and income.

**Amazonia** – This is a portfolio that works towards the development of sustainable production chains in the Amazon region, based on the use of local natural resources, land use planning and environmental management to stimulate agribusiness and family-based production in that region.

**Aquaculture** – The portfolio's purpose is to generate knowledge and technologies that lead to solutions for the rational use of natural resources and help the elaboration of public policy, in order to strengthen and ensure the social, environmental and economic sustainability of Brazilian aquaculture.

**Automation, Precision Agriculture and ICT** – The present portfolio works with automation, precision agriculture and information and communication technologies to enhance the sustainability of production systems and add value to agricultural products and processes.

**Coffee** – The portfolio's priority focus is to generate knowledge to make sustainable technological solutions for the competitiveness of the Brazilian coffee agribusiness possible.

**Meat** – The portfolio conducts, promotes and monitors the obtainment of impacting results for Brazilian society. The innovation challenges are related to bovines; goats and sheep; poultry and swine; and security and quality of meat as food.

**Coping with Droughts** – The portfolio works to improve production conditions and quality of life in areas of water scarcity through innovative solutions. Priority focus on the Brazilian Semiarid region.

**Diversification and Market Niches** – It generates cultivation technologies and adds value to products, processes and services according to consumer market demands.

**Energy, Chemistry and Biomass Technology** – The portfolio's purpose is to value biomass products, bringing significant economic and environmental gains for the country.

**Genetic Engineering in Agribusiness** – The portfolio's goal is to obtain innovation solutions with a focus on the use of biotechnological tools.

**Fibers and Biomass for Industrial Use** – A portfolio that aims at the improvement and sustainable expansion of fiber production for textile use and of biomass for bioenergy and food purposes.

**Forestry** – The portfolio deals with sustainable forest management, forestry and forest breeding, environmental compliance for rural properties, and forest conservation, towards in technological solutions to improve sustainable forest production.

**Temperate Fruit Farming** – The portfolio's goal is to work on technological bottlenecks in order to develop the quality of fruit and byproducts.

**Tropical Fruit Farming** – The portfolio focuses on technological innovation for tropical fruits in order to develop fruit quality, inform public policy and meet the demands of the production sector.

**Grains** – Increasing the competitiveness and sustainability of the grain production chains in the different Brazilian regions through Research, Development and Technology Transfer for Innovation is the goal of the portfolio.

**Vegetables** – The present portfolio induces innovations to promote the sustainable intensification of production, value aggregation to different chains, and higher vegetable consumption, so as to develop the population's food security and diversity.

**Organizational Innovation** – Improving, consolidating and updating Embrapa's management models, mechanisms and tools, while encouraging the information and knowledge sharing and collaborative work, are the goals of the portfolio.



**Social Innovation in Agriculture** – The portfolio’s goal is to find solutions for social and environmental problems. Segments are territorial social innovation, territorial development and territorial multifunctionality.

**Biological Inputs** – It develops solutions for pest control, nutrition and adaptation of plants aiming at environmental conservation, public health, animal welfare, productivity, quality, competitiveness and sustainability in agribusiness.

**Integrated Crop-Livestock-Forestry Systems** – This portfolio maps and supports the organization, generation, integration and dissemination of knowledge and technologies on integrated production systems.

**Intelligence, Management, and Territorial Monitoring** – The portfolio integrates multidisciplinary teams to inform public policy and corporate strategies in light of changes in Brazilian agriculture.

**Milk** – Through research, development and innovation, the portfolio contributes to establishing the foundations on which Brazil can become a top milk producer/exporter in the world.

**Rational Management of Agrochemicals** – The portfolio generates technical-scientific foundations to rationalize the use and minimize the impacts of agrochemicals in different Brazilian agro-ecosystem with emphasis on the sustainable exploration of natural resources and on the zoo-phyto-sanitary security of production chains.

**Climate Change** – It invests in solutions for the adaptation of production systems in light of the challenges posed by climate change, contributing to national and global food security and for the control of national greenhouse gas emissions.

**Nanotechnology** – The portfolio articulates research and development in nanotechnology, so as to produce technological innovations, knowledge and solutions to increase productivity and reduce and/or mitigate the environmental impacts deriving from agricultural and agro-industrial production processes.

**Nutrients for Agriculture** – The portfolio contributes to increasing efficiency and to the introduction of new sources of nutrients in Brazilian agriculture.

**Pastures** – The portfolio contributes to sustainable animal production in pastures, in response to public policy and demands from the Brazilian production sector.

**Genetic Resources** – The portfolio deals with conservation of plant, animal and microorganism genetic resources, which provide genetic variability to the Embrapa’s and the National Agricultural Research System’s (SNPA) research, development and innovation activities.

**Animal Health** – The portfolio works with the diagnosis, prevention, control and eradication of diseases of mandatory notification established in national programs and epidemiological monitoring systems, and diseases of major impact for animal production.

**Plant Health** – It aims at significantly reducing production losses and the global costs of managing biotic stresses in Brazilian agriculture, ensuring an increment in the biological services of agro-ecosystems and safe food production.

**Environmental Services** – The portfolio works to ensure multiple environmental services and biodiversity conservation in agricultural and forestry production systems in rural, periurban and urban areas of Brazil.

**Ecologically-based Production Systems** – The portfolio contributes to preserve the health of farmers and consumers through the rational use of the natural and socio-economic resources available, in order to enhance the economic and ecological sustainability of agriculture.

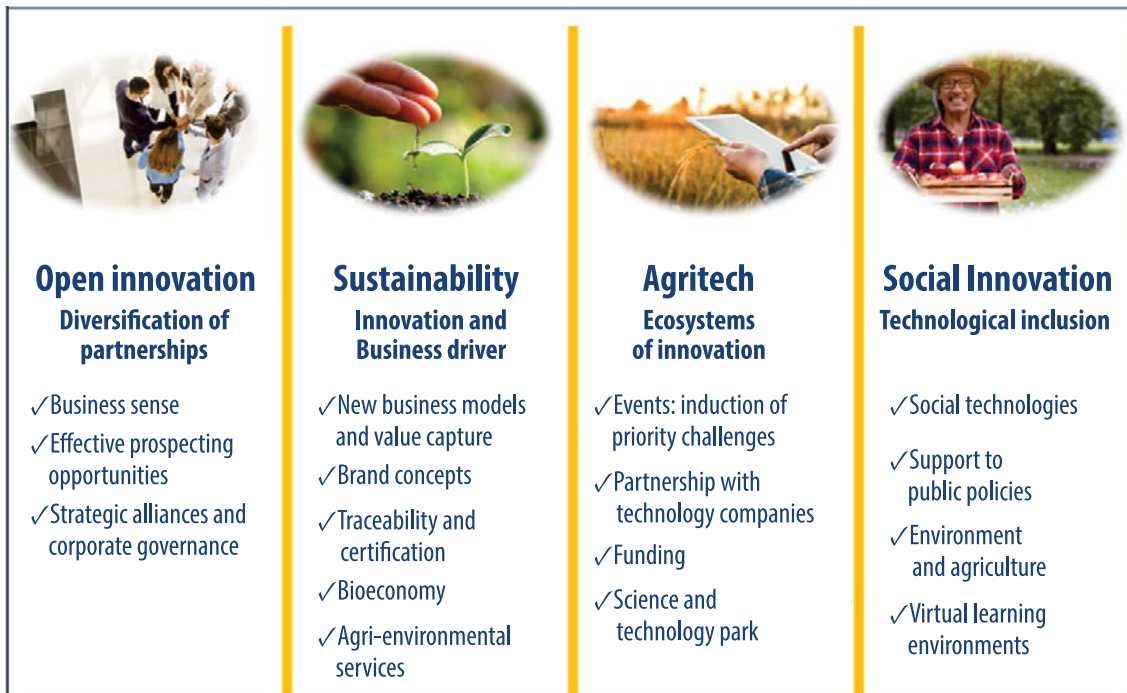
**Brazilian Soils** - The portfolio prospects for demands/problems regarding soils and generates solutions to enhance the competitiveness and sustainability of Brazilian agriculture.

## Business and Innovation strategic view

Innovation context has been going through important changes in the last years, and those changes, on their side, convey that corporations in all domains review their business strategies in order to improve their relation with consumers and different stakeholders. These transformations have generated impact concerning the way companies relate to society and how they occupy the market. It is increasingly noteworthy the migration of a linear supply model of products and services to the building of wider and more comprehensive strategies, comprising greater possibilities of adoption and impacts in different kinds of public.

Aiming to improve instruments of inclusion in the market, Embrapa has undertaken initiatives to enhance the assets qualification process, to identify new dynamic access to market, to build institutional arrangements more agile and flexible and provide to the institution legal instruments focused on innovation and new business models. In 2018, Embrapa established structuring processes for activities focused on innovation and business, so that to improve its organizational efficiency, to assimilate opportunities opened by the new CT&I legal framework, to promote improvements in its business relations and social innovations so that to consolidate guidelines for incorporating innovation on open strategies established according to its Innovation Macro-process.

In addition, there is also an institutional effort aimed at identifying opportunities so that to establish new business and approaches in the value capture over products, processes and services developed by Embrapa. Opportunities were identified from macro trends indicated in the document Vision 2030 and also they are the output of Embrapa's relationship with the productive sector, because they conform aspects in order to generate impacts to agribusiness and to Brazilian society.



**Figure 5.** Opportunity Matrix to new business and value capture.

The year 2019 is dedicated to the consolidation of structuring processes as well as to the advancement in the opportunity matrix to new business and value capture, and the implementation of organizational goals by Secretariat of Business and Innovation is considered the reference mechanism for advances in the implementation of the new strategies.

Embrapa also will advance in appropriation of the benefits that the new ST&I Legal framework opened to the development of science and technology institutions (STI) in the country, allowing new arrangements, dynamics and business models.

The continuity of the accomplishment and improvement on the Núcleo de Inovação Tecnológica (NIT) [Center for Technological Innovation] as a tactical structure to Embrapa's innovation policy, by means of Secretariat for Business and Innovation is a key aspect in this process.

Under this considered situation, the diversification of the partnership matrix focuses on the determination of new opportunities so that to channel the process of open innovation. Thus, the new organizational strategy will allow the company to move forward in the discussions with investment funds, communication technology and computer science companies, food industries as well as gastronomy sector, innovation ecosystems, agribusiness companies and agro groups, besides strengthening the relation with State research organizations [OEPAS], representatives of the producer class entities, ICTs.

Expanding the array of partnerships involves mapping opportunities and large connections that merge business acumen and specific skills of Embrapa's research centers,

valuing the tangible and intangible assets (cash valued or not). The actions mark the beginning of construction of a new strategy of approach to partners and stimulating business environment at Embrapa, with a more proactive performance, concerned with market opportunities as well as value creation to the developed technologies, products and services.

Due to a demand of the company focused on producing results (outcomes), in 2018 the development of work is to be restated to a process-oriented model. This restatement means that changes happening externally affects our operating pattern and performance, and, thus, must be taken into consideration so that we can keep on returning strategically and appropriately to society, which is the final customer.

Considering the characteristics and dynamic traits of Research, development and Innovation (the primary activity of Embrapa), management and governance concepts, aligned to the process-oriented model, aiming to enhance the efficiency and effectiveness in the institution must be continually updated and revised.

## EMBRAPA'S BUSINESS PLAN

### RD&I Results and Goals predicted for 2019

Most of the knowledge produced by Embrapa is available to society and does not generate royalties nor indirect incomes. They are social impact technologies linked to public policies or processes and agricultural systems. This knowledge provides science and technology support to many sectors in Brazilian agriculture. The impacts of these results appear every year in the increase of agriculture production, improvement of food quality, increased exports, expansion of the offer of alternative energy sources, environmental conservation and in the generation of strategic knowledge to the country.

Technical independence of such a research institution like Embrapa allows one to have continuous investment as to medium and long term in areas that are not still interesting to business or aiming at the exporting market and to the constitution of major commodities. The institution, besides searching for solutions to the challenges in the productive sector, operates so that to anticipate demands and continuously deliver solutions.

It is also noteworthy that Embrapa does not operate straightly in the agricultural market, therefore it does not trade products or process by itself, in a separate form, landing in an open innovation model to practice its value delivery to Brazilian society. That means that partners or customers of the productive sector are necessary so that technological solutions established by Embrapa can reach environmental and productive sector, adding value and generating innovation.

Given these conditions, RD&I strategic goals listed in this Business Plan are directed towards the effective adoption of technological solutions by the productive sector (outcomes) as well as to the generation of respective impacts and benefits in the social environment. The goals are designed on a specifically, measurable, achievable, and relevant manner so that to attend to a five year term, and they are sustained in the important impact of the technological solutions developed by the institution in each productive segment (<https://bs.sede.embrapa.br/balanteriores.html>) and in planning new technology releases. Yearly, for the purpose of monitoring the achievement of goals, the obtained results in the base year will be estimated related to the increased adoption as well as to the impact of technological solutions already developed with the adoption of new technologies arranged and transferred to the productive sector in the base year.

Below, the 12 strategic objectives on Embrapa's Master Plan are listed with their respective RD&I associated strategic goals, based on indicators of effectiveness (adoption and use of technological solutions and impact). To each of these goals, a set of results predicted to be delivered in 2019 is described. Since 2018, Embrapa uses the Technology Readiness Levels and Manufacturing Readiness Levels in order to monitor the development of its technological assets. The appropriate application of this scale at corporate level facilitates the understanding among research teams, external partners and customers about the developmental stage in which a certain asset as well as to identification of business opportunities and transfer.

TRL/MRL scale is widely disseminated and utilized globally by the various institutions of science and technology, ranging from starting level 1 (ideation) up to final level 9 (continuing production). The following RD&I listed results are in agreement with new technological assets that reached maturity level by this measurement (TRL/MRL 6), performance in production environment (TRL/MRL 7) or production (TRL/MRL 8) in 2018 and were made available for technology transfer or partnerships to co-development in 2019.

Below are goals and results predicted to 2019 according to the strategic objectives.

## Predicted Results and Goals concerning Institutional Development

The actions of management and institutional development are linked to Strategic Guidelines on the VI Embrapa's Master Plan.

Considering organizations are encouraged to seek internal management models which may provide efficiency in its operations, so that they become more competitive and survive the market on a long term, Embrapa has been implementing a model of organization and production of work aligned with modern trends. Thus, in 2018, the company redirected the work for a model following the process-oriented actions and the intention is to increase its performance, through a sustainable systematic.

Table 4. Goals and results predicted to 2019 according to the strategic objectives.

<b>Strategic Objective 1</b>	<b>To develop knowledge and technologies to the required management and sustainable use of the Brazilian biomes</b>
<b>Goal 1</b>	<b>To increment until 2023 the economic benefit generated by agricultural practices and sustainable cost-reducing technologies developed by Embrapa and partners in 15%, taking into account the year 2018 (Source: Balanço Social)</b>
	Agricultural practices for seed treatment, techniques of sowing and adaptation of machinery, strategies for forest recovery under reserve areas, soil management in lowland areas, new alternative energy from CLF integrated systems, recommendations for water resources management and renewal of plantations, recommendations for forage legumes, guide to recognition of natural enemies, new recommendations for consortium of technologies at the semi-arid region, good agricultural practices for the culture of the cotton plant and new practices for obtaining and use of fertilizers
	Fertilizers - Intelligent fertilization system for grain production so that to improve soil fertility, new alternatives to organic and organomineral fertilizers, development of substrates, biofertilizers and new alternatives of composting
	Biological pest control: new techniques of monitoring and rating scales, development of new products, technology of releasing parasitoids in the productive environment
	<b>Detailing/Outline</b>
	Recommendation of water schemes in management of irrigation for sugarcane in Cerrado
	Crop recommendation for renewal of plantations aiming at greater availability of water in the soil
2019 Results	Recovery of water resources impacted on agricultural areas
	Irrigation recommendations for increasing the efficiency of water use by sugar cane in Cerrado
	Recommendation concerning a consortium of sorghum and sunflower with Cowpea beans on underground damns in the semi-arid region
	Technical recommendations concerning the introduction and management of Sudanese grass BRS Estribo
	Ryegrass seed treatment with gibberellic acid to improve the pasture establishment
	Maximum cut on systematization of lowland soils
	No tillage technique with adaptation of planters and use of leguminous shrubs in forestry recovery in reserve areas
	Tropical forage grasses: characteristic and use recommendations
	Intelligent fertilizer to grain production systems for soils under improved fertility
	Management recommendations to Campanha fields, Fronteira Oeste and Missões in RS

<p><b>Strategic Objective 1</b></p>	<p><b>To develop knowledge and technologies to the required management and sustainable use of the Brazilian biomes</b></p>
	<p>Process of obtaining organomineral fertilizers based on fine charcoal from fast pyrolysis of eucalyptus wood fines</p>
	<p>Capim-piatã management in milk production integrated systems</p>
	<p>Note scale for evaluation of <i>Rhizoctonia solani</i> injuries in seedlings of cotton, beans and soy</p>
	<p>Recommendations on good agricultural practices for destruction of cotton cultural remains</p>
	<p>Recommendations of GAP to mixed ensilage of millet and sunflower as an alternative to increase the offer of quality forage in Semi-arid region</p>
	<p>Basic mineral fertilizer – natural compound shale carbonaceous and Ca Mg carbonate</p>
	<p>Use of animal by-product meals as organic and organomineral fertilizer: chemical characterization, assessment of pathogens and verification of release of N in the soil</p>
	<p>Biochar based substrate</p>
	<p>Technological basis for generation of photo-voltaics in CLI and CLFI systems</p>
	<p>Biofertilizer generated from bovine production waste</p>
	<p>Practice of use of granulated fertilizers with multifunctional microorganisms</p>
	<p>Composting of sugar cane agro-industrial waste with vinasse</p>
	<p><i>Burkholderia pyrrocinia</i> Isolated (BRM 32113)</p>
	<p>Monitoring rice stem bug (<i>Tibraca limbativentris</i>) through pheromone traps</p>
	<p>Microbiological insecticides based on baculovirus to control army worm, soybean looper and <i>Helicoverpa armigera</i></p>
	<p>BRM 27666 <i>Isaria javanica</i> isolated (CG 1282)</p>
	<p>Technology for releasing parasitoids</p>
	<p><i>Telenomus remus</i> to control worms in the Spodoptera complex in soybean and corn cultivations</p>
	<p><i>Trichogramma pretiosum</i> to control lepidoptera eggs in soybean</p>
	<p>InNat Guide - Guide to recognition of natural enemies of agricultural pests</p>
<p>2019 Results</p>	

<b>Strategic Objective 2</b>	<b>To develop knowledge and technologies so that to enable solutions that increase the resilience and plasticity in native ecosystems and in agriculture production systems, as well as to amplify the ability of the agriculture to adapt to climate changes</b>
<b>Goal 2</b>	<b>To contribute to knowledge and technology for low-carbon agriculture promoting mitigation of 35 million tons equivalent CO<sub>2</sub> until 2023</b>
	Wood production systems, forestry recovery, alternatives to grass management, seed processing techniques, new options of cover plants, procedures for handling of animal carcasses and appraising the ecosystem services.
	Integrated systems: new integrated production systems for different biomes and reclaiming systems of degraded pastures, arrangements of agroforestry systems for reclaiming of APP and income generation.
	Growth promoters inoculants and adjuvants
	Strains of bacteria and Inoculants intended for cultivation of vines, grass, soy, beans, corn and growth promoters adjuvants for rice
	<b>Detailing/Outline</b>
	Grazing management recommendation for Quênia and Tamani grasses
	Forest management: 'pau-de-balsa' wood production system
2019 Results	Recommendation of massai grass management deferred for sheep and goats in Semi-arid region
	Integrated systems – crop-livestock and crop-livestock-forest integration (CLI / CLFI) to Cerrado in MG
	Crop-livestock integration systems to the Agreste region in the Brazilian Northeast
	Recommendations for the establishment of pastures with forage legumes
	Recommendations of cover plants for no tillage of the cotton plant
	Cover plants for no tillage in Acre State
	Recommendation for mixed pastures (leguminous grasses) for sheep and goats in the Semi-arid region
	Procedures to remove carcasses of dead animals from rural properties
	Forest restoration method of the Amazon to control exotic grass



<p><b>Strategic Objective 2</b></p>	<p><b>To develop knowledge and technologies so that to enable solutions that increase the resilience and plasticity in native ecosystems and in agriculture production systems, as well as to amplify the ability of the agriculture to adapt to climate changes</b></p>
	Maximizing forage production under CLI systems to the semi-arid region
	Recommendation of heights for the management of natural pastures of the rough straw type
	São Mateus System
	Recommendation of integrated control of the annonigrass under grazing brachiaria
	Brachiaria and cowpea intercrop intended for grazing under integrated crop livestock (ICL) systems
	Integrated method for recovery of degraded pasture - Mirapasto
	Alternatives for reclamation and enrichment of native degraded pastures in Pantanal
	Program for the valuation of ecosystem services on native pastures
	Height management for adjustments of stocking rates in grazing
	Seed processing of species of the Paspalus genus in order to improve the pasture establishment
	Intensive system of pasture management at milk production farms
	Proposal of minimum arrangements on biodiverse agroforestry systems on the recovery of APP, together with food production and income generation
	Mycorrhizal inoculant to vine, brachiarias, soy and beans
	Diazotrophic bacteria strains ( <i>Azospirillum</i> spp) for inoculum on maize aimed at nitrogen supply
	Procedure containing Rhizobacteria ( <i>Pseudomonas fluorescens</i> and <i>Burkholderia pyrocinia</i> ) and an specific group of adjuvants for the promotion of growth controlling diseases in rice
<p>2019 Results</p>	

<b>Strategic Objective 3</b>	<b>To expand the knowledge base and the generation of assets which can enhance the development and incorporation to agrifood and agroindustrial systems of advanced technologies based on emerging science and technology</b>
<b>Goal 3</b>	<b>Facilitate the incorporation into the production process (employ/use/exercise) of, at least, advanced solutions on emerging technologies to agrifood and agroindustrial systems until 2023</b>
	New products based on nanotechnology to be used in agrifood and industrial processes as well as chemical processes aiming at efficiency and sustainability to the energy productive chains.
	<b>Detailing</b>
	Nanocellulose films added with tannin
	Production processes of cellulose nanofibrils films
2019 Results	Charging process of silica nanoparticles with thymol and use of MFC as agglutinant
	<i>Setaria viridis</i> plants genetically modified to increase accumulation of sucrose
	Fermentation process of acetoin production from crude glycerin using new bacterial strains
	Process for the production of phenolic derivatives from catalytic hydrogenation of lignin followed by isolation and purification processes
	Process for production of xylitol from biomass hydrolyzed of sugar cane rich in xylose using a new <i>Candida tropicalis</i> strain
	Catalytic chemical process for the production of xylitol from sugarcane bagasse

<p><b>Strategic Objective 4</b></p>	<p><b>To develop, to adapt and to release knowledge and technologies on automation, precision agriculture and information and communications technology so that to enhance sustainability of productive systems as well as to add value to agriculture and livestock products and process</b></p>
<p><b>Goal 4</b></p>	<p><b>To increase at a 50% rate the number of application users as well as digital systems created by Embrapa and partners until 2023, taking into consideration the year of 2018 (Source: Balanço Social)</b></p>
	<p>Softwares, intelligent systems, apps in phytosanitary areas, management, good practices and cultivation</p>
	<p><b>Detailing</b></p>
	<p>Territorial strategic intelligence system of the Brazilian Agriculture Macro-logistic</p>
	<p>Custo Fácil App (Easy cost)</p>
	<p>Guia Clima app</p>
	<p>Manejo florestal 4.0</p>
	<p>FertOnline Mobile</p>
	<p>InNat Guide – Guide to identify natural enemies of agricultural pests</p>
<p>2019 Results</p>	<p>UZUM: expert system for diagnosis of diseases and pests in the culture of the vine</p>
	<p>GepLeite</p>
	<p>PastoCerto</p>
	<p>Planin-Pupunha</p>
	<p>API SATVeg</p>
	<p>Software Arboreto</p>
	<p>Adubapasto 2.0</p>
	<p>Software Arbopasto</p>
	<p>GeoInfo: Embrapa's spatial data infrastructure</p>
	<p>SISILPF – Taeda</p>

<b>Strategic Objective 4</b> <b>To develop, to adapt and to release knowledge and technologies on automation, precision agriculture and information and communications technology so that to enhance sustainability of productive systems as well as to add value to agriculture and livestock products and process</b>	Desafio Eco Granja
SISILPF – Elliottii	SISILPF – Mogno
API Agritec	Application of Intelligence and Market Center of sheep and goats (CIM Rebanho)
Spatial data infrastructure (IDE) of Embrapa Solos	SISILPF – Teca
SISILPF – Cedro	Program of genetic improvement of cattle – Geneplus Embrapa
RRiskBtweb - System for risk assessment of evolution of insect resistance and toxins of <i>Bacillus Turinghensis</i> (Bt) expressed in transgenic crops	Manejo-Matte - App for diagnosis of planted yerba mate (maté)
SISILPF – Eucalipto	Evapo Temp: Calculation of water requirement based on air temperature
BioAqua - Database for assessment of water quality in fish culture	Roda da Reprodução 2.0
FertOnline Mobile	SISABIOF (Simplified application system of biofertilizers)
SIAGEO Amazônia - Interactive geospatial analysis system of the Legal Amazon	E-Planfor – Forrage and food herd planning
Software ACHA: Evaluation of water contamination by pesticides	
2019 Results	

<p><b>Strategic Objective 4</b></p>	<p><b>To develop, to adapt and to release knowledge and technologies on automation, precision agriculture and information and communications technology so that to enhance sustainability of productive systems as well as to add value to agriculture and livestock products and process</b></p>
<p>2019 Results</p>	<p>Computerized system for handling management of savage swine – SIMAF</p>
	<p>RECOMENDA - Content recommendation system for users of hot sites and mobile applications</p>
	<p>SIMP Mamão</p>
	<p>App Cria Certo</p>
	<p>SustenAgro version 1.0 - System for evaluating the sustainability of sugarcane and soybean</p>
	<p>Environmental management system in Pigs</p>
<p><b>Strategic Objective 5</b></p>	<p><b>To promote and strengthen RD&amp;I for biology safety and zoo-phytosanitary defense of Brazilian agriculture and forest production</b></p>
<p><b>Goal 5</b></p>	<p><b>To increase at a 10% rate the economic impact from technologies to the management of zoo-phytosanitary problems developed by Embrapa and partners until 2023, taking into consideration the year of 2018 (Source: Balanço Social)</b></p>
	<p>Practices, methodologies, management and parasitoids to biology safety and zoo-phytosanitary defense</p>
	<p><b>Detailing/Outline</b></p>
	<p>Nematec</p>
	<p><i>Trichogramma pretiosum</i> to control eggs of Lepidoptera in soybeans</p>
	<p><i>Telenomus podisi</i> for the management of the complex of bugs in the soybean and corn crops</p>
<p>2019 Results</p>	<p>Minimum biosafety practices for pig farms that produce animals for slaughter</p>
	<p>Monitoring methods for the whitefly in muskmelon plants</p>
	<p>Parasitoids to the control of <i>Ceratitis capitata</i></p>
	<p>Rational management of pesticides</p>
	<p><i>Telenomus remus</i> to control caterpillars of the Spodoptera complex in corn and soybean crops</p>

<b>Strategic Objective 5</b>	<p data-bbox="268 510 300 1854"><b>To promote and strengthen RD&amp;I for biology safety and zoo-phytosanitary defense of Brazilian agriculture and forest production</b></p> <p data-bbox="339 1077 371 1854">Monitoring the population of the banana weevil using traps of the “Cunha” kind</p> <p data-bbox="395 1171 427 1854">Method for the mass trapping of natural enemies of muskmelon pests</p> <p data-bbox="451 1265 483 1854">Monitoring the population of the banana weevil using traps</p> <p data-bbox="507 1547 539 1854">Strategic control of the horn fly</p> <p data-bbox="563 1032 595 1854">Microorganisms to control <i>Fusarium verticillioides</i> and to promote the growth of corn</p> <p data-bbox="619 723 651 1854">Microbiological pesticides based in <i>Bacillus thuringiensis</i> (Bt) to control main pests of corn, soybean and cotton crops</p> <p data-bbox="675 1055 707 1854">Isolated of <i>Trichoderma asperellum</i> BRM 29104 (TR 356) and BRM 29576 (TR 6966)</p> <p data-bbox="730 1417 762 1854">Parasitoids to the control of <i>Ceratitits capitata</i></p> <p data-bbox="786 1093 818 1854"><i>Telenomus podisi</i> to control the complex of bugs in the soybean and corn crops</p>
<b>Strategic Objective 6</b>	<p data-bbox="847 365 879 1854"><b>To develop innovative production systems that are able to increase agriculture, forest and aquaculture productivity, maintaining sustainability</b></p>
<b>Goal 6</b>	<p data-bbox="922 237 994 1854"><b>To increase at a 20% rate the economic benefit generated through technologies that promote productivity gains developed by Embrapa and partners until 2013, taking into consideration the year of 2018 (Source: Balanço Social)</b></p>
2019 Results	<p data-bbox="1018 947 1050 1854">Innovative systems of disease control, product placement and provision of ecosystem services</p> <p data-bbox="1074 1664 1106 1854"><b>Detailing/Outline</b></p> <p data-bbox="1129 1167 1161 1854">Honey production system to the south region of Rio Grande do Sul (RS)</p> <p data-bbox="1185 1122 1217 1854">Techniques to mitigate the risk of HLB spread in family base citrus localities</p> <p data-bbox="1241 1279 1273 1854">Production system of the culture of pineapple to Acre State</p> <p data-bbox="1297 611 1329 1854">Livestock production systems suitable to promote better balance in the provision of ecosystem services in Mata Atlântica biome</p>

<b>Strategic Objective 7</b>	<b>To foster knowledge improvement and technological solutions aiming to increase agriculture and livestock contributions so that to integrate food, nutrition and health</b>
<b>Goal 7</b>	<b>To increase in a 10% rate the economic impact generated by technologies which add value to food products developed by Embrapa and partners until 2023, taking into consideration the year of 2018 (Source: Balanço Social)</b>
	Adding value cultivars, innovative techniques and processes
	<b>Detailing/Outline</b>
	Lineages of special rice with black pericarp
	Red Rice BRS – 901
	BRS Caingá Amora Preta (BlackBerry)
	Feijão – BRS Ártico (Beans)
	BRS BLD Yari Erva Mate (Yerba mate)
	Sweet potato cultivar biofortified, pro-vitamin A enriched – BRS Amélia
2019 Results	Production of gluten free cereal bar containing derivatives from sorghum and cashew fiber
	New citrus cultivar for the extraction of essential oils and manufacture of tea
	Maracujá BRS MJ (passion fruit)
	Non-conventional enological techniques for preparation of red wine
	Novo
	Snack made of wholemeal flour of Cowpea (Macassar, fradinho)
	Sheep housing cuts techniques
	Snack made of flour of Cowpea cotyledon (Macassar, fradinho)
	Almond oil of cashews

<b>Strategic Objective 8</b>	<b>To create agriculture innovation assets supported by the use of biocomponents, raw materials, and technological routes that help the development of new bioindustries aiming at renewable energy, sustainable chemistry and new materials</b>
<b>Goal 8</b>	<b>To facilitate the incorporation by the productive sector (adoption) of at least five technological solutions to industry concerning renewable energy, green chemistry and new materials until 2023</b>
	Chemical processes, films and genetically modified plants
	<b>Detailing/Outline</b>
	Biocomposite films
	Sugar cane plants MATE gene expression
	Sugar cane plants AREB gene expression
2019 Results	<i>Setaria viridis</i> plants genetically modified to increased accumulation of sucrose
	Use of the kraft lignin in formulation of controlled release on integrated pest management agriculture
	Process for the production of phenolic derivatives from lignin catalytic hydrogenation followed by isolation and purification processes
	Process of production of Kojic acid using crude glycerine
	Catalytic chemical process for the production of xylitol from sugar cane bagasse
<b>Strategic Objective9</b>	<b>To support the improvement and the formulation of strategies as well as public policies, from analysis and studies aligned to the market and rural development needs</b>
<b>Goal 9</b>	<b>To increase at a 5% rate the economic benefits derived from public policies framed with the support of Embrapa until 2023, taking into consideration the year of 2018 (Source: Balanço Social)</b>
2019 Results	Implementation of federal public policies PronaSolos and RenovaBio



<b>Strategic Objective 10</b>	<b>To generate knowledge and technologies and to suggest strategies, locally adapted, that contribute to the productive inclusion and to family farming</b>
<b>Goal 10</b>	<b>To contribute to the productive inclusion through the generation of 60.000 new direct jobs until 2023</b>
	Management, good agricultural practices, new cultivars adapted to family farming
	<b>Detailing/Outline</b>
	Management strategies for ILPF systems to familiar dairy production
	Dry matter content of the fruit as a parameter to the handling of plants and harvesting of mangoes for the high acceptance of the fruits by consumers
	Recommendations of cover plants for no tillage of the cotton plant
	DRIS Manga Spreadsheet to interpretation of the results of a foliar analysis
	BRS 416 Cotton Cultivar
	BRS Novo Horizonte
	Management of dryland rice favored
2019 Results	Paclobutrazol application through irrigation system
	BRS 2357; BRS 3213; BRS 2299; BRS 2336; BRS 3210; BRS 1216 coffee cultivars
	BRS 2314; BRS 3220; BRS 3137; BRS 421
	BRS Novo Horizonte and Juraá – cassava
	BRS Imponente – cowpea beans
	BRS Morena – sesame
	BRS 425 – Peanut
	Recommendations of good agricultural practices for the destruction of the cultural remains of the cotton plant
	Postharvest quality of BRS Vitória grape with extracts of algae of the genus Lithothamnium during the productive cycle in São Francisco valley
	Alternative systems of watermelon cultivation irrigated to the Cerrado in Roraima

<b>Strategic Objective 10</b>	<b>To generate knowledge and technologies and to suggest strategies, locally adapted, that contribute to the productive inclusion and to family farming</b>
	Determination of the rate of decomposition of green manures in semi-arid irrigated conditions
	Irrigation management for an efficient cultivation of pear tree for the Brazilian semi-arid
	Recommendation for the BRS Clara cultivar to São Francisco valley
	Dose and time of application of ethanol vapor to the Giombo persimmon bletting
2019 Results	Cup management in seedless grape cultivars
	Chemical management with herbicides for destruction of the cultural remains of the cotton plant
	Recommendation of soil coverage in irrigated cultivation of watermelon
	Fertilized organic substrate for the production of Argentine cedar ( <i>Cedrela fissilis</i> ) seedlings
<b>Strategic Objective 11</b>	<b>To generate knowledge and technologies that enhance management innovations to deal with efficiency, efficacy and effectiveness in the growing complexity and multifunctionality of agriculture</b>
<b>Goal 11</b>	<b>To increase at a 10% rate economic benefits generated through innovative systems and services that enhance efficiency, efficacy and effectiveness developed by Embrapa and partners until 2023, taking into consideration the year 2018 (Source: Balanço Social)</b>
	Models of zootechnical annotations for economic management of rural properties
	CF – Custo Fácil
2019 Results	Application of Intelligence Center and market of sheep and goats (CIM Rebanho)
	SustenAgro version 1.0 System for evaluating the sustainability of sugarcane and soybean
	Environmental management system in Pigs
<b>Strategic Objective 12</b>	<b>To develop and to release information products and communication strategies that contribute to the enhancement of agricultural research as well as to increase the support of the society to the Brazilian agriculture</b>
<b>Goal 12</b>	<b>To increase at a 10% rate the insertion of Embrapa at the media up to 2023 and at a 5% rate the reach of technical and scientific publications, taking into consideration the year of 2018</b>
	Embrapa's citations in the press and online media
2019 Results	Download publications in Ainfo, Alice and Infoteca repositories
	Citations of Embrapa's technical-scientific publications

From this perspective, several actions were planned so that to assure the main deliverances of Embrapa to society, proven by means of institutional corporative systems, as well as through reporting and within the regulatory framework.

## Research and development management

The goals expressed below are concerned with Guideline 4 of the VI Embrapa's Master Plan (VI PDE), which are:

**Guideline 4:** To increase efficiency in the research and development management

**Goal 1.** Reorganize and implement the process model of governance of the critical resources to research and development (genetic resources, laboratories and infrastructure on a multi-users trait) to 2023.

Create and implement a new model of governance of the critical resources to research and development (genetic resources, laboratories and infrastructure on a multi-users trait) to 2023.

### 2019 Results:

- Qualitative analysis of the information on the Diagnostic of national structures and multi-users laboratories
- Update to the regulatory standards of the Multi-users Laboratories

**Goal 2.** Implement and monitor the Embrapa Management System with focus on innovation strategically realigned throughout the Embrapa to 2023.

### 2019 Results:

Embrapa Management System and other systems updated, with internalization of these changes in Embrapa as a whole, aiming at the strengthening of production and provision of assets with a focus on innovation, as well as criteria for releases of new calls of defined projects and guides, methodologies elaborated.

- Innovation challenges on new Portfolios validated with the managers of the Embrapa centers, and regionalized, with prominent stakeholders of productive chains.
- Management Panel of Embrapa's research programming, with charts and scorecards, finished and made available.
- Portfolios' Informational Panel, presented in the form of report illustrated with graphs and tables, finished and made available.
- Process of interaction between SPD and Sire, to plan the innovation challenges aiming at the strategic objectives in the PDE, megatrends in the Visão 2030 document, impact goals, public policies and ODS [SDG], validated.

## Management for Business and Innovation

To promote harmony between Embrapa and the market and continually generate impact and value to society, a set of medium term organizational goals and results for the year 2019 have been defined.

In these circumstances, it is important to note that the goals and procedures/measures are included in the planning of the areas which work in innovation and business processes and transversally contribute to the Embrapa's strategic objectives.

In addition, the organizational goals for innovation and business contribute predominantly for the Strategic Guidelines 2, 4 and 5, which are:

- (2) To promote excellence in organizational management based on efficiency, efficacy and effectiveness;
- (4) To increase efficiency in the RD&I management and
- (5) To improve business network and relations with national partners.

**Goal 3.** Contribute and internalize the normative political framework to business and innovation in Embrapa to 2023.

This measure includes the coordination, development and internalization of the normative political framework to business and innovation in Embrapa, that encompasses a set of rules, strategies and manuals, in accordance with Manual de Governança de Processos da Embrapa. Considering the recent regulation of the Innovation Law (Lei de Inovação), there are a number of corporate regulatory that need to be soon implemented so that Embrapa can make use of the benefits of the law.

In 2019, in order to proceed with the establishment of the innovation policy of Embrapa, the following strategic results will be delivered:

- Policies, standards and guidelines aiming at partnerships in innovation and business, intellectual property and innovation stimulus subvention; and
- Strategy of structuring and launching calls for public funding to finance RD&I, through Agências de Fomento [Funding Agencies] or through Investment funds, to institutions which adopt Embrapa technologies.

**Goal 4.** Consolidate Embrapa's business and innovation network, considering strategic, tactical and operational aspects until 2023.

This measure includes the establishment of a multidisciplinary network involving professionals of Embrapa research centers working with business and innovation. The measure includes the training and strengthening of the teams and expertise in innovation.

In 2019, the following priority strategic results shall be delivered:

- Proposition and structuring of an internal network on business and innovation;
- Development and internalization of the Operational Maturity Assessment Model of Business and Innovation Process.

**Goal 5.** Promote a favorable environment for entrepreneurship, as a way to strengthen the open innovation and implement the company's strategy of digital transformation until 2023.

This measure includes aspects in which Embrapa needs to strengthen and update itself: Open Innovation, entrepreneurship and digital transformation. Beyond strategic corporative partnerships, Embrapa needs to be close to more advanced environments of innovation, including start-up companies that have potential to absorb and enhance the technologies developed by Embrapa in an agile and not bureaucratic way, generating mutual benefits and positive impact on society. Additionally, the measure involves the interfaces of science and open innovation, open data and new business.

In 2019, the following priority strategic results shall be delivered:

- The company's guidelines for the relationship of innovation environments and start-ups.
- Initiatives to agribusiness innovation ecosystems, fostering similar innovation challenges, such as Ideas for Agro.

**Goal 6.** To implement and manage the strategic process of negotiation and business relationship with partners concerning assets of Embrapa until 2023.

The creation of a team dedicated to marketing is promoting advances in portfolio management of assets in Embrapa. Concerning 2019, six groups were conceived, which shall have their business models established and/or improved: inputs, agro-industrial and industrial processes, nanotechnology, biotechnology, services/digital assets and sustainable production systems.

In 2019, the following priority strategic result shall be delivered:

- Strategic plan of measures aimed at expanding the promotion and business relationship with the agricultural sector.

## Organizational Development

Goals 7 to 11 are related to Guideline 2 of the VI Embrapa's Master Plan (VI PDE), which is:

**Guideline 2.** To promote excellence in organizational management based on economics, effectiveness, efficiency and effectiveness.

**Goal 7.** To place in all research centers the Integrated management system (Conecta Project) so that to enhance organizational effectiveness, efficiency and effectiveness in the personnel, financial and asset and supplies management processes, until 2023.

## Results for 2019

ERP implemented in Embrapa in three instances: personnel, financial and assets and supply.

ERP (Enterprise Resource Planning) shall be implemented in 2019 in the institution as a whole by means of the Conecta Project.

Embrapa acquired the ERP aiming to enhance the integration and support to administrative processes, in the scope of Personnel, finances and supply management. ERP gathers, organizes and provides data with agility, making them interconnected and thus making the everyday life of its users easier. So it allows greater transparency, efficiency and safety in information of interest to employees, managers and control bodies.

The project is divided into three steps: 1) Process diagnosis and System acquisition; 2) System deployment; 3) Planning of future actions based on acquired knowledge and accumulated experiences. Among the benefits some of them stand out:

- Information integration and functionality that enables more effective management of processes and resources;
- Agility with decision making;
- Standardization and process efficiency;
- Compliance, transparency and control.

**Goal 8.** Implement the processes of planning, monitoring and evaluation of performance concerning technological and organizational innovation in all research centers until 2023.

## Results to 2019

Qualified research centers concerning the use of prospecting methods, prioritization and planning adopted by Embrapa:

- Prospecting methods and prioritization of problems and opportunities prepared in partnership between Embrapa's Secretariats and research centers.
- Research centers qualified in the use of planning methods for the Organizational and Innovation Goals of Embrapa.
- Research centers qualified in the use of prospecting methods and prioritization of problems and opportunities as well as planning of Technological Innovation Goals of Embrapa.
- New model for the performance appraisal drafted and rendered with research centers.

- Joint impact assessment methodology drafted and available to be used in the process of Institutional assessment (appraisal).
- Model for assessing the efficiency and effectiveness of the research centers, revised in accordance with the new directions of the institution, approved by the Executive Board and published in BCA.

**Goal 9.** To map and monitor the events of fraud and corruption in Embrapa's research centers until 2023, making information and important documents about integrity available.

**Results 2019:**

Structuring documents on Integrity Management approved

- Drafting of a new code including conduct, ethics, and integrity in a single documents, for the interdisciplinary reach of the Integrity Process.
- Integrity Plan drafted according to CGU recommendations which can be found in the Guia de Implementação de Programa de Integridade [Guide to carry out the Integrity Program] in state-owned companies and in the Relatório de Avaliação da Integridade em Empresas Estatais n 201601698 [Assessment Report about Integrity in state-owned companies].

After the rendering of this plan, it will be possible to carry out the integrity management reliably, covering the most sensitive aspects (those which require more attention) so that to embrace all employees aiming the improvement with more maturity concerning this theme on the Embrapa side.

**Goal 10.** Monitor the risks, through the review of risk matrices, establishment of action plans to address the risks, implementation of performance indicators and the definition of effectiveness tests with established routine to support strategic decision making at Embrapa, as to the priority organizational processes of research centers until 2023.

**Results 2019:**

Structured documents and methodologies on Risk Management published:

- Risk and integrity Management policy: Internal Regulations (Bylaws) of the Comitê de Governança, Integridade, Riscos e Controles Internos (CGIRC) [Governance, integrity, risks and Internal Control Committee].
- Courses on the long distance learning modality about management of Risks in Embrapa drafted.
- Methods prepared: Operational Risk management; Risk Management of Projects and Process prioritization.

- Risk Management - Development of risk matrices and response plans.
- Risk matrix and action plan of a priority process by secretariat drafted according to methodology developed.

**Goal 11.** Make Embrapa's critical informational assets organized, retrievable, protected, accessible and reusable according to Policy, normative, strategic planning and current methodology, in collaboration with players e internal instances until 2023.

### **2019 Results:**

Normative framework concerning Data, Information and Knowledge Governance enhanced. Drafting of the following documents:

- Embrapa's Open Data Plan prepared, according to decree n 8.777/2016.
- Embrapa's Governança de Dados, Informação e Conhecimento [Embrapa's data governance, information and knowledge] policy.
- Geospatial Data Management service instruction (GeoInfo platform) prepared.
- Normative Instruction on Acesso e Tratamento da Informação na Embrapa [Access and treatment of information in Embrapa].

Integration of Embrapa's measures with Brazilian Open Science. 4<sup>th</sup> National Plan of the Open Government Partnership (OGP): drafting, rendering and monitoring of the commitment "To establish governance arrangements of the scientific data to the advancement of Open Science in Brazil".

- Guidelines and principles on institutional policies that support Open Science defined.
- Terminological tools developed to organization, definition, standardization and releasing of terms and concepts of Open Science.
- International Network for Open Science created in the environment Research Data Alliance (RDA).

Data, information and knowledge Governance processes rendered. Data and Information Management: the definition, adaptation and institutionalization of processes and tools.

- Proposal for Corporate Program of Management of Data Research elaborated
- Proposal for Corporate Program of Data privacy governance elaborated according to Law 13.709/2018.



## Strategic Intelligence

Goals 12 and 13 are related to Guideline 2 in the Embrapa's VI Master Plan (VI PDE), which is:

**Guideline 2.** To promote excellence in organizational management based on economy, effectiveness, efficiency and effectiveness.

**Goal 12.** Review, propose and establish a planning, intelligence and strategic governance process for Embrapa until 2023.

### **Results 2019:**

- New Master Plan prepared and approved.

The last Embrapa's Master Plan (VI PDE) was accomplished in 2014 concerning a long term span up to 2034. However, due to the changes and transformations that have occurred due to the own technological intensification, and the need for an ongoing process of construction, standardization, modulation and update scenarios, in 2018, Embrapa prepared a new prospective document that presents updated information and analysis on the future of the Brazilian agriculture. In this document, there are indications on various topics that should be incorporated in the new version of the Master Plan (PDE). Also, since the last update of the Master Plan (PDE), important organizational changes occurred in the structure and mode of operation on Embrapa's research centers, incorporating new governance and management concepts, aligned with process management, to increase the efficiency and effectiveness of the company. Changes that, in some way, altered the activities related to planning, both at the strategic level and in the operational. In this scenario, although the core units (administrative) concentrate much of the competencies of institutional planning, research centers also have expertise with a focus, mainly, in the subjects they work with.

**Goal 13.** To establish up to 2023 the governance in Embrapa's relationship pattern with public authorities, entities representing the productive sector, foreign institutions with an interest in agricultural innovation, media and their representatives.

### **2019 Results:**

- Proposal for a system of institutional governance of international themes.
- Embrapa's proposal for international cooperation strategies strengthening already existing programs as well as partnerships that can bring new opportunities to the company.
- Strategies for capturing parliamentary amendments to support projects of the research centers.
- Intensification of Embrapa's relations with the private sector through a forum with representatives of the main associations of the Brazilian agricultural segment.

# PRODUCTION CAPACITY CONSTRAINTS

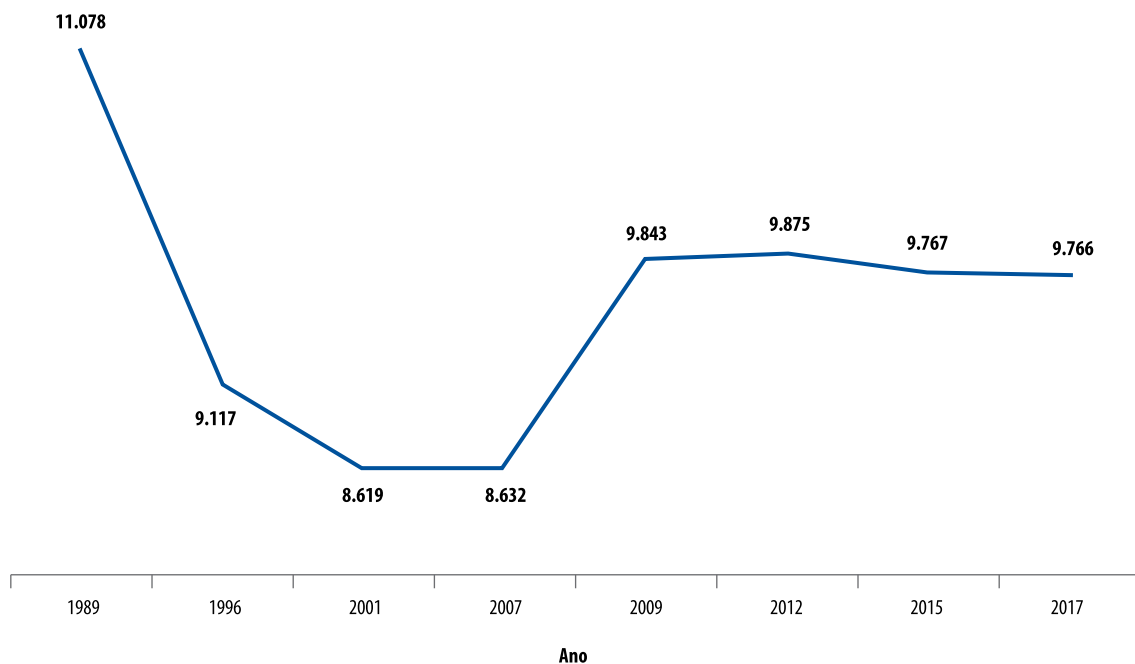
## Budget

The annual schedule of the Embrapa budget is defined by Lei Orçamentária Annual (LOA) [Annual budget Law], in which priorities in the Plano Plurianual (PPA) [Multianual plan] are defined as well as the goals which shall be reached in that year. All this accordingly to guidelines defined in the LDO (Lei de Diretrizes Orçamentárias), estimating revenues and setting federal government expenditure for the financial year.

2019 LOA was approved in Congresso Nacional [National Congress of Brazil] with an addition of R\$ 38 million compared with the previous year's equivalent budget bases, corresponding to a total of R\$ 3.634.372.758,00.

## Human Resources

At present, Embrapa counts with a workforce of 9.486 employees (updated in Dec/06/2018). 2.434 are researchers, out of which 2.112 have a doctoral degree. The team plays in different networks and in partnership with public and private institutions, national and international, with a focus on research, development and innovation.



**Figure 6.** Embrapa's workforce (established by SEST/MP – maximum limitation) evolution 1989 – 2017.

Table 5. Embrapa's budget allocations in the LOA 2019: by item (category) of expenditure and source, in R\$ 1.00.

Item (Category)	Treasure			Own institution income			Total	%
	0-100	0-188	0-250	0-263	0-280	0-281		
<b>STAFF</b>	<b>3,076,814,759</b>	-	-	-	-	-	<b>3,076,814,759</b>	<b>84.66</b>
- Staff	3,060,614,759	-	-	-	-	-	3,060,614,759	84.21
- Sentences	16,200,000	-	-	-	-	-	16,200,000	0.45
<b>OTHER COSTS</b>	<b>444,947,219</b>	<b>4,915,244</b>	<b>32,523,259</b>	-	<b>2,600,854</b>	<b>2,670,594</b>	<b>487,657,170</b>	<b>13.42</b>
- Sentences	3,383,519	-	-	-	-	-	3,383,519	0.09
- Benefits	195,358,407	-	-	-	-	-	195,358,407	5.38
Discretionary expenses	244,705,293	-	32,523,259	-	2,600,854	2,670,594	282,500,000	7.77
- Amendments (*)	1,500,000	4,915,244	-	-	-	-	6,415,244	0.18
<b>INVESTMENTS</b>	<b>51,185,088</b>	<b>13,224,518</b>	-	<b>4,661,921</b>	-	<b>829,302</b>	<b>69,900,829</b>	<b>1.92</b>
- Other expenses	25,627,022	-	-	4,661,921	-	829,302	31,118,245	0.86
- Amendments (*)	25,558,066	13,224,518	-	-	-	-	38,782,584	1.07
<b>TOTAL</b>	<b>3,572,947,066</b>	<b>18,139,762</b>	<b>32,523,259</b>	<b>4,661,921</b>	<b>2,600,854</b>	<b>3,499,896</b>	<b>3,634,372,758</b>	<b>100.00</b>

(\*) Data from the CMO site of the Câmara Legislativa Federal [Chamber of Deputies]

(\*) Amendments informed by SIRE/GRIG.

## Infrastructure

Embrapa consists of seven core units (administrative) plus 42 research centers distributed throughout the national territory. Research centers are divided in product centers, service centers, eco-regional centers and centers dedicated to basic themes (Figure 5). Embrapa leads a national agricultural research network that, in a cooperative way, carry out research in different geographic areas and fields of scientific knowledge. There are 600 laboratories generating research that goes beyond the impact of agricultural production: they contribute, for instance, to the formulation of public policies and the advancement of knowledge in several areas.



Figure 7. Distribution of Embrapa's research centers in the national territory.

## FINAL OBSERVATIONS

The goals for Embrapa were established according to the strategic objectives of the VI Master Plan, and results that Embrapa plans to deliver were listed so that to fulfill its mission and to reach the vision of future.

However, considering the characteristics and dynamic traits of research, development and innovation, this is an evolving paper, which must be enhanced as the processes in the institution undergo continuous cycles of development and improvement on its assets.

Thus, for the next cycle, the revision of the Embrapa's Master Plan (VII PDE) is programmed. The PDE revision will be based on the Visão 2030 document [Vision 2030], which contains updated information and analysis about the future of the Brazilian agriculture (Subitem 2.1). After updating the Master Plan, a review of the strategic goals and their respective indicators is planned in the next cycle of the Business Plan.

Finally, we clarify that the strategic results in the organizational goals for innovation and business will be proven through corporate institutional systems, as well as the elaboration of reports and the formal establishment in the company of the related normative framework.



MINISTRY OF  
AGRICULTURE, LIVESTOCK  
AND FOOD SUPPLY

