innovation management

We are at the frontier of innovation in agribusiness, expanding our field connectivity project every year and investing in research and studies aimed at increasing productivity. In 2019, we approached the innovation ecosystem, with challenges proposed to startups in the AgroExponencial Program

INNOVATION MANAGEMENT

Research and development of new technologies and agricultural practices drive efficiency and productivity in our operations. These benefits increased with the advance of digitalization and connectivity, which led to important transformation in all stages of the production cycle in the last years.

In order to centralize and coordinate the management of this theme, we count on the Innovation Committee, structure that completed its second year of activities in 2019. The Committee's main guidelines include fomentation to innovative culture and connection with agribusiness innovation eco-system, aligned with the best market practices and marked by focus on open innovation. To guide the initiatives proposed by the Committee, we wrote our Innovation Ambition, aligned with the current corporate strategy phase.

The Innovation Committee is currently responsible for managing the two programs included in the innovation architecture, AgroExponencial (a startups connection program, whose first cycle occurred in 2019) and Ideias & Resultados (an intrapreneurship program, launched in December 2019). With this structure, our company strengthens the innovation culture and also the evolution of administrative processes. With regard to people management, for example, new solutions changed and strengthened employees' qualification to a more digital universe and improved processes for selection and hiring of talents (learn more on page 41).

Innovation Ambition

Being connected with the most modern technology and processes, being and early-adopter of innovations, by means of effective filtering the best solutions (external and/or internal) and their quick implementation in all areas/units that may benefit from them, measuring gains.

AGRO EXPONENCIAL
conexões para impactar positivamente

ideias&resultados

CONNECTIVITY TO DIGITAL AGRICULTURE

In 2019, we expanded the field connectivity project to five units, covering an area of approximately 70 thousand hectares with internet signal. The initiative covers the installation of telecommunication towers with 4G technology – 700 Mhz, integrating the agricultural operation to our company's management systems, in Porto Alegre (Rio Grande do Sul).

Digital sensors installed in agricultural machines and telecommunications in real time provide scale gains and higher control of agricultural activities. In the intelligence center, specialized technicians follow the development of activities in plantations and assess several types of data – like plantation failures, route and speed of machines, input application, among other important aspects to better execute agriculture planning.

With this structure, technicians and operators go to the field with precise and updated information. Through apps in tablets and smartphones, they manage the fleet and agricultural operations, in addition to receiving agronomic data and alerts for the best working of machines and equipment.

Our goal is to conclude the integration of all the other farms by the end of 2020. The digitalization of agriculture leads to a significant increase in field operations' quality, offering clearer benefits to the large scale agriculture that we practice.

At the end of 2019, we covered **70,000 hectares** on five farms with **4G technology**, allowing the integration of agricultural operation with corporate management systems

Innovation in plantations' management

Targeted application

The technology involves the use of embedded sensors in agricultural machines turned to the localized application of pesticides. In some cases, as in the control of weeds in cultures' post-harvest phase, there is up to 95% reduction in the use of the inputs.

Aerial spraying

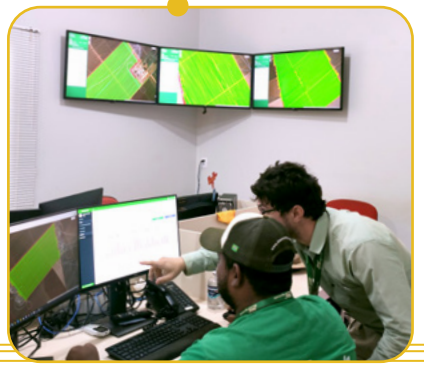
The system improves the follow-up of aerial spraying of pesticides and fertilizers, increasing the efficacy of applications. In 2019, the tool was tested in three farms and, due to good results, 100% of the cultivated area will be monitored in 2020.

Weed monitoring

System of monitoring by drones that localizes and informs the amount of weed in plantations. The aerial monitoring helps in the construction of a map for localized application of herbicides. The tool is being tested in three farms.

Georeferenced plantation monitoring

Georeferenced monitoring platform that creates maps of levels of plagues and diseases infestation. Information is directly transmitted to the plantation sprinkler and makes the application only where infestations can cause economic losses. All the cultivated area is already monitored by the tool.

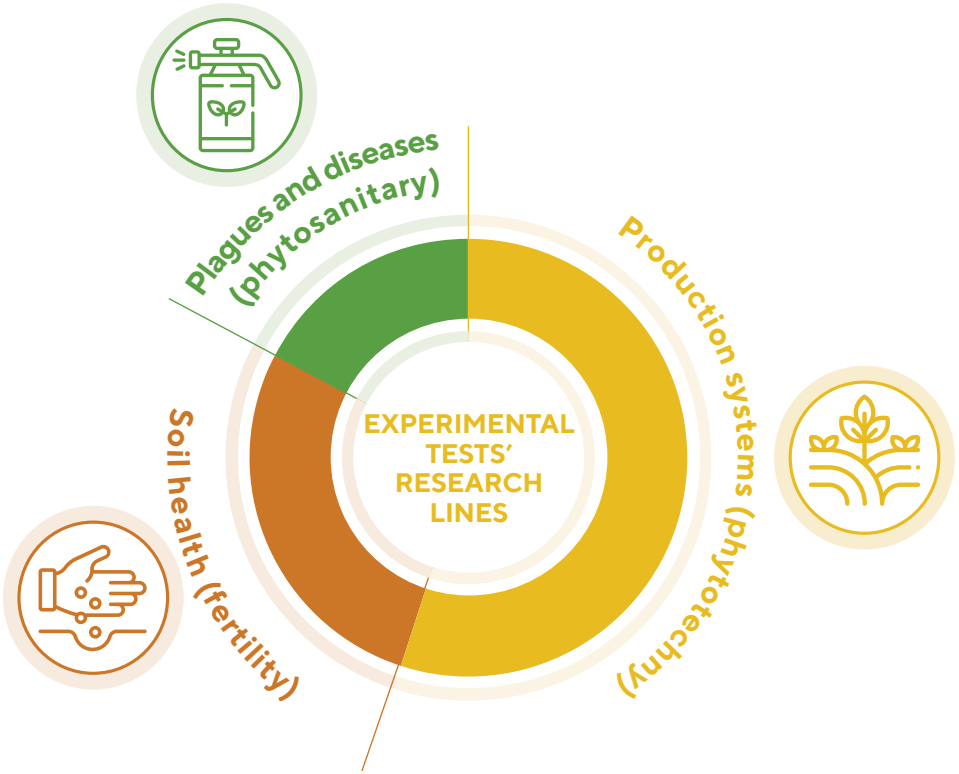


Biofactories

The biological management of plagues presents significant environmental and economic advantages. Products cost, on average, 7.5 times less that chemical solutions and present high efficiency against plagues, with over 80% of efficiency in most cases. Moreover, its actions preserve micro fauna and other insects (like bees) and is directed only to natural enemies.

Biodefensive production is made internally, in the farms. This technology, result of research conducted by the company, does not fully replace the use of chemical defensives. However, when jointly used, solutions increase plantations' efficiency and productivity.

RESEARCH AND PLANNING



Our company counts on teams dedicated to research and structuring of knowledge on the behavior of cultures in the different Brazilian regions and climate conditions. Our goals in research activities are validation of technologies and assessment of managements and innovation in production techniques, aiming at gains in efficiency (productivity, cost reduction or operational improvement). We work with experimentation areas in 13 farms, totaling 1.5 thousand hectares destined to tests. The tests follow strict standards of agricultural experimentation, where all data are analyzed by dedicated professionals using statistics tools. Results are consolidated in managerial reports and used in our agricultural planning cycle.

In 2019, a total of 415 tests were carried out for soy, cotton and corn cultures' studies in Central-West and Northeast regions. Most tests are intended to adjust cultures' positioning; however, fertilization strategies, soil management and assessment of phytosanitary technologies are very important in our research lines. The results obtained in experimental and commercial areas indicate that there is potential for productivity growth in the localities where we operate, a continuous challenge linked to agribusiness sustainability.

Investments in research make possible the identification of genetic varieties better adapted to climate and soil conditions for the micro-regions where we operate. Thus, we increased productivity per planted hectare and reduced losses due to climate factors.

Research data compilation and cultures' performance assessment, for over 30 years, created a robust database to subsidize planning of agricultural operations. This phase, conducted by our company's experts, is one of the most important in the production process, because it defines the acquisition of inputs, times for plantation and harvest and operation of machines in the field.

Evolution in climate monitoring

The permanent monitoring of climate conditions with adoption of cutting-edge Technologies assists in decision making to develop agricultural operations. Our farms count on own stations, forming a network that makes available data in real time on climate and allows forecasts with fewer risks.

Other digital equipment for measurement and climate analysis, like digital rain gauges, are being installed in experimentation phase. With this technological structure, we seek to measure and obtain better understanding on rainfalls and improve our decisions on plantation and application of defensives and fertilizers.

Message
Who we are
Strategy
Innovation management
People
Planet
Prosperity
Annexes

In 2019, we reinforced the use of an artificial intelligence system exclusively developed to our company, which cross-checks information and assist in determining the best types of seed for each cultivation area. Data manipulation by intelligent algorithms is one of the strategies we adopt to increase productivity in each plantation, maximizing the use of the data mass generated by the research. With the results obtained in the 2018/2019 crop tests, we identified soy productivity superior to 102 bags/hectare (Planalto Farm) and cotton productivity superior to 450 arrobas/hectare (Paiaguás Farm), even under second crop conditions where the potential is more limited than that of the first crop.

Our investment in research generate tax credits to be discounted from the company's Income Tax and Social Contribution and are reinvested in research infrastructure with acquisition of equipment and machines and re-adaptation of laboratories. Tax relief in 2019 amounted to R$ 1.5 million.

In addition to internal use for strategic actions and planning, our research also plays an important social role. Many results obtained in tests are shared with neighbor producers. Thus, we strengthen exchange of knowledge and the joint adoption of good practices. We learn together, assessing good examples and continuously identifying opportunities and threats for assessment in research. In 2019, 18 days of field were held, involving almost 1,250 people.

Artificial intelligence **in agricultural planning**

Digitalization and use of artificial intelligence systems make possible cross-checking of data and provide more efficiency in the choice of seeds

- Database with **20 years** record in all farms
- Climate data compiled in the last **40 years**
- **2,717** cultivars
- Over **10.3 million** simulated combinations
- Over **9 million** records on the database

AGROEXPONENCIAL PROGRAM

Executed for the first time in 2019, the AgroExponencial Program is a platform, under the Innovation Committee management, that connects our company to startups with innovative solutions for problems that are not being addressed by our traditional supplier chain currently. The platform, structured in partnership with Innoscience consultancy, selected seven finalists to develop pilot projects.

The program received registrations from 185 startups that were invited to propose their solutions for one of the ten challenges of the initiative, and were assessed and selected in several planned stages. The finalist projects could conduct pilot activities in our units. The objective of this work model is to identify pioneer technologies with potential to be included in our production system and associated gains, aligned with the High Efficiency pillar of the current strategic phase. By the end of 2019, five pilot projects were already concluded and two others were in progress. Three of them were chosen for rollout in order to speed up the capture of gains identified in the concept test.

10 challenges proposed

- Tracing of cotton cargoes
- Agricultural YIELD GAP management
- Tax/accounting reconciliation
- Monitoring of cultures
- In loco sampling and/or analysis of nutrient contents in soil
- Sensing tools for on-time nutritional diagnosis
- Management of land applications of agricultural defensives
- Nematological mapping
- Identification of damages in grains
- Identification of contaminants in cotton