

Chapter 5

Solutions and challenges

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Solutions

Brazil is a great power in food production: fruits and vegetables, grains, meats and milk, cotton, sugarcane and many others. Its industrial diversification reaches home agroindustries, artisan family agroindustries and small family agroindustries, which show significant growth. In addition, Brazil is one of the largest exporters of commodities, in which Embrapa had a significant participation in the development of this sector so important in the national economy. In addition, Embrapa constantly contributes to qualification and training of the various factors that make up this agroindustrial complex.

Despite this growth of Brazilian industry in recent years, losses and wastes in Brazil are still large, despite being a commodity exporter. Losses can occur from production to post-harvest, storage, consumption and industrialization. The processing industry has the lowest rates of waste, since it normally takes full advantage of the received raw materials. Embrapa has developed targeted research to generate technologies focused on the whole use of raw materials.

However, despite the growth in food agroindustrialization in Brazil, there are several difficulties, such as lack of stakeholders' organization, problems in enterprises legalization, lack of access to production and low capacity, common among small Brazilian food producers.

Embrapa maintains several means of qualification of its employees in research, as well as several mechanisms to achieve successfully incremental research, development and innovation. Agropensa is one example, whose system designs the future of agricultural research, as well as the portfolios of areas of research, which allow Embrapa's research workers to develop projects based on market

trends. In addition, several TV, radio, YouTube and social networks programs aim at informing and training the producers in the various technological solutions.

Despite Embrapa's performance in Brazilian agricultural research, there is a need to increase research investment in Brazil to ensure the continuity of the virtuous cycle of innovation in the agricultural sector. It is imperative to encourage more intense engagement of the private sector in agricultural R&D activities. Increasing the contributions of national treasury resources is, of course, strategic action, which must be pursued. Public-private partnerships in agricultural research, focusing on high impact innovations, are interesting ways to ensure a significant part of the innovation flow. To broaden and consolidate the set of RD&I actions – public, public-private, private –, in accordance with well-designed goals and objectives, is vital to guarantee the sustainability and competitiveness of Brazilian agricultural and related productive chains in the coming decades (Martha Júnior et al., 2016).

Embrapa presents, as results of its research projects, products that can be appropriated by agroindustries, both family and commodities, focusing on the development of new products and the improvement of the agroindustrial food processing for the population benefit. There are several solutions, from products developed based on plant raw materials, as well as from animal origin, and processes and machinery. Thus, the solution can go from a cultivar developed for industrial purposes, or a simple equipment to break an almond shell, or a portable meat industrialization unit approved to obtain legal records of production and commercialization.

Future challenges and possibilities

In spite of the various technological solutions developed by Embrapa, there is a need for a look at the future and work towards the development of new products and technologies that meet the demands of the new generations.

In the “bioeconomy” era, the possibilities of diversifying traditional agricultural – biopharmaceuticals, bio-inputs and bioproducts – make their products substantially more valuable and smaller exposure to the price cycles of agricultural commodities. It is possible that conditions that are more robust will emerge for a greater productive inclusion and for the sustained income expansion in the field, as greater possibilities for product differentiation and market expansion are established (Martha Júnior et al., 2016).

Among the potential future to be explored, there are some quite expressive facts in the agribusiness and food area, being necessary:

- The development of automation and precision agriculture strategies for value added to agricultural products, including the development and adaptation of sensors and actuators for automated systems, both in the production and processing of agricultural products.
- The elaboration of strategies for the spatial evaluation of agricultural property, determining the most suitable sites for generating differentiated products, including the development of sensors, techniques for characterization and similar for product and process traceability, quality and safety improvement, contributing to environmental, social and food safety certification.
- The production of high-efficiency, long-release agricultural inputs and ingredients for target compounds that can add value to the agricultural chain, such as nanofertilizers, nanopharmaceuticals, additives (aroma, nutraceuticals, pharmaceuticals, chemicals, semiochemicals, etc.) that allow for greater efficiency in its functionality.
- Development of production processes, reuse and optimization of energy sources from the perspective of sustainable use of renewable raw materials.
- The prospection of new materials to improve agroindustrial processes, such as fertilizer application, controlled and localized chemical release, in water decontamination, sanity, nutrition and reproduction, among others.
- The generation of new materials based on agricultural products and waste from manufacturing processes for non-food uses, including the search for new components and constituents of interest to different industrial sectors such as the chemical, plastic, automobile, paper, textile and pharmaceutical industries, as well as the development of new polymers, substances and biomolecules synthesized on biotechnology platforms, including synthetic biology, gene-editing tools and others.
- Prospection of bioaccessibility, bioavailability and in vitro and in vivo efficacy of compounds of interest, as well as preclinical and clinical evaluations to substantiate allegations of food functionality.

- The development of food processing techniques to obtain new industrialized products through the Food Design concept, such as edible thin films, functional foods, fortified, reduced or free of sugar, sodium and trans fat, for specific audiences (athletes, seniors, children and others), including design for animal nutrition.
- The establishment of research focused on quality and value added in strategies of productive arrangements of small and medium producers, including strategies for agricultural family evolution of high profitability family enterprises.
- The development of added-value technologies to byproducts, waste and effluents from different chains.

Trends

Considering the consumer's point of view, some trends are:

- Teas and juices: specifically for the beverage market, emphasizing natural products (pure, whole), nutritious (rich in vitamins, minerals, fibers), functional (with good health-enhancing properties – "superfruits", "superfoods", "pre and probiotic), with caloric reduction (lower sugar or sugar-free contents), for specific publics (pregnant women, elderly, athletes) or mood-products (to cheer up, encourage, relax, energetic).
- Considering the sustainability issue, there will be a trend in the search for beverages with reduced consumption of plastic material in packaging and juices with carbon footprint reduction, with recycled and recyclable packaging.
- In addition to the "good health" concept, large companies are already committed to reducing sugar by up to 25% in the coming years. There will be a 10% increase in natural beverage consumption, with reduction of soft drinks and artificial juices, in addition to the increase of fiber intake, prebiotics and probiotics.
- Consumers will seek food directly linked to their specific good health needs, aimed at reducing cholesterol, improvements in gastrointestinal transit, specific vitamins, among others.

However, these foods must be sensorially pleasant, convenient and practical and provide information about their properties to consumers.

In relation to animal product, trends converge towards: (a) consumers willing to pay more for products that meet the needs of animals; b) animals raised with comfort and well-being as they tend to become less sick; c) imposition of large groups on suppliers to adhere to animal welfare practices.

Finally, there is a need to maintain public policies, such as the Food Acquisition Program (FAP) and the Brazil's School Feeding Program (Pnae), which promote the insertion and consumption of regional foods and the adoption of traditional foods by young people, aiming at the creation of a traditional and regional sensorial memory, with the rescue of cultural, ethnic food, among others, developed still in the infant-juvenile age. Allied to these factors, there is a need for producers' qualification to meet the quality standards of the products, according to the legislation of the inspection agencies.

Reference

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Recommended literature

EMBRAPA. **Visão 2014-2034:** o futuro do desenvolvimento tecnológico da agricultura brasileira: síntese. Brasília, DF: Embrapa, 2014. Available at: <<https://ainfo.cnptia.embrapa.br/digital/bitstream/item/108955/1/Documento-Visao-versao-completa.pdf>>. Accessed on: Dec. 7, 2017.