

**Brazilian Agricultural Research Corporation
Ministry of Agriculture, Livestock and Food Supply**



Sustainable Development Goal 3

GOOD HEALTH AND WELL-BEING

CONTRIBUTIONS OF EMBRAPA

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Chapter 3

Food and well-being

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Introduction

The target 3.4 of Sustainable Development Goal 3 (SDG 3) is “By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being” (United Nations, 2017). These issues include food availability as well as their nutritional quality through safer production systems.

Advancements in food, nutrition and health research and their relationships have brought clarity to role diet plays in improving human health. For this reason, investments in research and dissemination of preventive actions are increasing. However, access to adequate food does not depend only on individual choices, but implies the investment of integrated public policies such as pedagogical activities and provision of adequate school meals, as well as incentives for the production, distribution and marketing of healthy foods (Malta et al., 2014).

Thus, adopting healthy and sustainable food practices is multidisciplinary and covers agriculture, food, nutrition and good health. Under its expertise, Embrapa has sought to develop technological solutions aimed at not only increasing the supply of food but also at reducing nutritional deficiencies, preventing diseases and promoting population’s good health.

Availability of quality food for at-risk groups

Embrapa is aligned with national policies aimed at supporting intersectoral initiatives to increase the supply of basic and minimally processed foods, at their production, supply, and promotion of conscious and healthy food consumption. Thus, these strategies are consistent with the study of Goodman (2003) in a quality turn perspective, that is, in research topics focused on food quality and alternative production practices.

Technological innovation initiatives, which aimed at improving health, start with ensuring and guaranteeing access to quality food for at-risk groups. An important

contribution of Embrapa is the Integrated System of Food Production, also known as [Embrapa-UFU-Fapemig Sisteminha](#), which consists of the productive integration between fruits, vegetables, poultry, fish and small animals, through the recirculation of nutrients. It is considered a low-cost and easily accessible technology, targeting the population of urban, peri-urban and rural areas, including indigenous villages and family farmers. In Brazil, several units were deployed in the five regions of the country, and were made available to African countries through international technical cooperation projects, such as the Agricultural Innovation MKTPlace.

Fruits and vegetables production using rainwater is another strategy developed by Embrapa and being used in the Brazilian semiarid region in order to meet household consumption needs, allowing the insertion of vitamins and minerals into the family diet. Federal government has been using this technology as food safety in the so-called Uma Terra e Duas Águas Program (One Land and Two Waters Program – P1+2).

Organic and agroecological production has been developed in the Sistema Integrado de Produção Agroecológica (Integrated System of Agricultural Production, [Sipa](#)), with numerous indications of vegetable consortia, green manure (rotation or consortium of vegetables with legume), organic compounds, vegetable cultivars adapted to organic handling and biological control by conservation to manage natural enemies of pests, innovations that [Chapter 4](#) will detail. Other technologies with this focus (Figure 1) are, for example, Quintais Produtivos ([Productive Backyards](#)) and the alternative system of poultry breeding (Barbosa et al., 2007).

Production of quality and enriched foods

After observing the increase in chronic non-communicable diseases (NCDs) and with the objective of making access to quality food increasingly affordable and universal, Embrapa has developed technologies that are used in agricultural and agro-industrial processes, which result in fortified and enriched products, probiotics and foods with reduced levels of fats, sugars and salts.

Adding fibers for functional purposes is a line that has been developed for different products. For dairy products, the production of [cheese](#) and [cream cheese](#) enriched with passion fruit fiber stands out, which, in addition to providing higher fiber levels, gives the product its flavor identity. Other technologies with this focus are, for example, [fiber-enriched tilapia nuggets](#), passion fruit peel soup (Cardoso et al., 2009) and [fiber-enriched paste](#) (Figure 2).



Photo: Edna Maria Cosme Santos

Figure 1. Alternative system for growing free-range poultry.



Photo: Tomas May

Figure 2. Fresh pasta enriched with passion fruit fibers.

With regard to fortified food products, Embrapa has contributed to the development of products on different lines. By means of genetic improvement techniques, new sweet potato varieties were obtained which have better productive efficiency, adequacy of characteristics for processing purposes (as chip production), presence of resistance genes to diseases and pests, and improvement in their nutritional characteristics. 'BRS Amélia' is an example of biofortification and presents high levels of carotenoids and very sweet flavor. The 'Beauregard' potato has ten times more carotenoids (pro-vitamin A) than its main competitors do.

Soymilk enriched with calcium is another product Embrapa has produced. Chocolate, strawberry and vanilla flavors had 15% of the calcium requirements according to the parameters of the recommended daily intake (RDI) and presented better sensorial and nutritional quality when compared to the product without addition of sodium lactate and flavorings agents. This milk represents an alternative product of better sensorial quality, capable of circumventing a nutritional limitation of conventional soymilk, that is, the low calcium content. Other examples of technologies in this line are [wheat flour and corn enriched with iron](#), [rice added with isolate protein](#), [grains enriched with sesame](#) and [tilapia sausage enriched with grape bagasse extract](#).

Embrapa also supports diagnostic actions on eating and consumption habits that aim to guide the strategic planning of government policies for healthy eating habits. In Rio de Janeiro, research and educational activities with youngsters from high schools corroborated sensorial tests of numerous products (grape nectar, bread roll and potato stick) with reduced contents of sugar, sodium (present in salt) and fat. Awareness and publicity actions were also promoted on the benefits of healthy eating by means of lectures, the distribution of a didactic booklet and a cartoon projection for children and adolescents.

This type of social intervention is important because of the growing sugar, fat and salt consumption, especially among young people, who are directly affected by the increase in overweight, hypertension and diabetes cases. According to data from the Pan American Health Organization (2014) and FAO (2017), the calorie value obtained through sugary, butter and oil products is significantly lower than the calorie produced by natural products, generating the so-called "obesogenic environment", which promotes the consumption of products rich in salt, sugars and fats in detriment of fresh and healthy foods such as fruits, vegetables, legumes, dried fruits and whole grains. This abundance of low-cost calories generates significant changes in diets such as those aforementioned.

The presented diagnosis has triggered the need for agricultural research to concentrate efforts on the development of technologies, products, processes or services (TPPS) that minimize the healthy food production costs. In this perspective, Embrapa has focused its efforts on the development of technologies in both agriculture and livestock, not only for products that target these types of reductions, but also for technology and knowledge generation for coping with NCDs. An example is [Recombinant Glucagon](#), a biologically active compound obtained and purified by Embrapa and partners that may be a relevant tool for the treatment of patients with diabetes or hypoglycemia.

In the line of food aimed at this public, Embrapa has in its portfolio of technologies the [Light Swine](#), a lineage of heavy animals, but with lean meat and low backfat thickness; jellies ([mixed](#) and [passion fruit ones](#)); low-sugar melon juice as an alternative to the juice industry; and [flours](#) and [cereals](#) for the whole grain and/or functional food industry.

Recently, the development of probiotic-function foods has been a tool in the industry to add functional value to these products. Probiotic bacteria are related to the modulation of intestinal microbiota, and its good health maintenance relates to a better use of foods and reduction in type 2 diabetes, which increases the importance of technology for the production of these types of food (Tonucci et al., 2017). For the food industry, regardless of the production scale, using probiotics is an opportunity to add value to conventional products, differentiation and meeting the demand for food that, in addition to nourishing, provides good health benefits. For this, Embrapa is active in the production of beverages and dairy products with probiotic function, such as [probiotic ice cream based on goat milk](#), [probiotic goat curd cheese](#), [pasteurized milk with probiotic](#) and [probiotic milk beverage with pineapple juice](#).

Besides food, other factors are considered when thinking about prevention of NCDs and other diseases that affect mainly the economically active population, such as stress and problems related to work activities, such as repetitive strain injuries, musculoskeletal problems and accidents at work. Therefore, in addition to the research and innovation focused on the awareness and use of healthy foods that influence the quality of life, Embrapa has invested efforts to stimulate the development of agricultural activity in favorable ergonomic characteristics, without losing focus on productivity.

Well-being on agricultural production

In rural areas, the great majority of workers are constantly exposed to potential sources of health problems, either because of the high efforts that make up the field routine, such as long walks; excess of physical effort due to transport of heavy raw materials and utensils; the use of different tools, machines and implements, as well as exposure to chemical and biological risks that follow farmers' lives from childhood to old age (Marques; Silva, 2003; Leite et al., 2007).

Given the importance of the agricultural sector to developing countries, in which the sector is one of the main responsible for economy dynamization, there is a need to increase solutions that minimize the risks to which workers are exposed and receive better performance in their work activities (Martins; Ferreira, 2015). Other technologies developed by Embrapa (Figure 3) to promote well-being of this public in several agricultural branches are: [Grafting Bank](#), harvesting workstation (Lana; Monteiro, 2014), desuckering by rotor-compression (Gasparotto et al., 2014), manual harvester of mango (Pinto; Ramos, 2000), [Extraction Equipment of Baru](#) [Almond](#), threshing machine of rice (Silva et al., 2002), [Spraying Machine by](#)

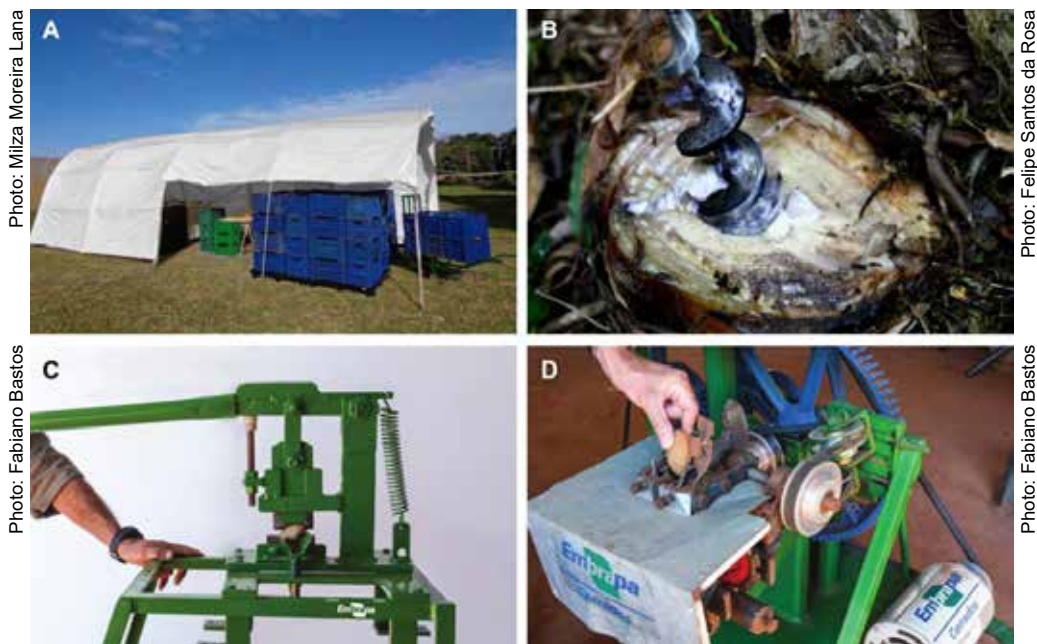


Figure 3. Embrapa technologies for rural well-being. Harvesting workstation (A); desuckering by rotor-compression (B); manual machinery (C) and electric machinery (D) of baru almond extraction.

[Human Traction](#) and course of [Formation of Swine Transports](#). Other technologies can be found in the e-book *Sustainable Development Goals 8* (Loiva et al., 2018).

In addition to the technologies, well-being is taken into account throughout the development of other solutions, which are also an evaluation factor of technology impact that is transferred to the society. For this, Embrapa has a software called System for Environmental Impact Assessment of Agricultural Technology (Ambitec-Agro), which is a set of multi-criteria matrices that integrate indicators of technological innovations performance and management of practices adopted in the accomplishment of activities. Seven key aspects of evaluation are considered: use of inputs and resources; environmental quality; respect for the consumer; employment; Income; good health; and management and administration. [Chapter 4](#) shows further details on this technology.

The results of this assessment allow farmers (or property managers) to determine which management practices have the greatest impact on the performance of their activity. To decision makers, managers and organizations, they can define policies and strategic instruments to improve the performance of rural activities, as well as to choose better options of practices, forms of management and technologies to the promotion of sustainable development through rural activities.

By knowing the importance of preventive actions and their impacts, it is fundamental that areas such as food and well-being are always in vogue on the political agenda and strategic institutional planning of research, science and technology agencies. Guaranteeing the workers the conditions to perform their task in a functional and healthy way is one of the goals, giving the population adequate food that actually promotes nutrition, not only satiety, but also encourages the use of technologies (and developing) which contribute to the improvement of a number of socioeconomic and nutritional indicators, especially in developing countries.

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