

Chapter 4

Education and entrepreneurship for sustainable rural development

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Introduction

Target 4.4 “By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship” (United Nations, 2017) of Sustainable Development Goal 4 (SDG 4) deals specifically with the provision of education for the development of people with technical and vocational skills and abilities in order to guarantee their access to decent work and employment, but also to the training of people capable of innovating and enterprising.

In rural areas, low levels of education, coupled with lack of skills and competencies, are one of the main problems that limit and restrict the appropriation of knowledge and the adoption of technologies. Disseminating knowledge and technological solutions and stimulating the investigative learning of science are tools capable of changing this scenario, contributing to the expansion of the well-being of rural communities, as well as to the generation and incorporation of technologies capable of promoting sustainable rural development.

This chapter presents different actions of the Brazilian Agricultural Research Corporation (Embrapa), both formal and non-formal, which contribute to the development of skills and competences in the Brazilian rural environment.

Schools and information technology

Embrapa Decentralized Units are stimulated, through programs, to establish strategic actions to disseminate knowledge and promote science and the development of technological solutions.

Mini Libraries

The popularization of science, the dissemination of Embrapa's research results and its use to improve production, food security, sustainability and income are among the targets of the Programa Institucional Minibiblioteca ([Mini Library Institutional Program](#)).

Each Mini Library is composed of 120 printed publications titles, 40 titles from Embrapa Prosa Rural radio programs and 37 video titles from the Field Day on TV and the rural video library edited by Embrapa.

Among the contents covered in the collection, the following stand out: preservation and environmental education, citizenship, cooperativism, gardening, quality food production, soil and water management, among others.

As a counterpart, the benefited school must carry out trainings with the teachers (aimed at guiding them on the use of the Mini Library), as well as interactive classes and mobilization actions with the participation of students and the local community for projects of common interest (Figure 1).

Embrapa Academic Hackathon

Entrepreneurial Education aims at the development of entrepreneurial skills and insertion in the world of work. It means valuing educational processes that promote the development of the human being so that they can contribute to the world of business and to the place where they are inserted.

Created in the late 1990s, *Hackathon* (an acronym for hacker and marathon) is an event that unites people of different profiles in a short space of time to develop a



Photo: Katia Simone Marsicano Correa

Figure 1. Students from Escola Família Agrícola de Orizona, GO, using the Mini Library books in a vegetable garden project.

technological solution to some problem or something that replaces or improves an existing solution.

In 2016, Embrapa began this movement of open innovation in search of collaboration and citizen participation. Focusing on university and school students, in 2017, *Hackathon Acadêmico Embrapa Nacional* ([Embrapa National Academic Hackathon](#)) was held, mixing academic knowledge with professional market practices.

With the participation of six Embrapa Decentralized Units, the event took place in the cities of Belém, PA, Boa Vista, RR, Brasília, DF, Recife, PE, Seropédica, RJ, and Teresina, PI. The 288 enrollees were high school, technical and undergraduate students, who formed teams and participated in the marathon in the city in which they registered, with the objective of developing solutions for specific topics as a way of generating technological innovations geared to the needs of the various regions of the country. The teams presented digital solutions using mobile applications, hardware solutions, internet of things (IoT) solutions, and educational parts/games focused

on technologies of agricultural interest. Canvas (design plan) and storyboard (prototype) were delivery requirements at the first meeting of teams. Students have learned that organization, deadlines, and commitment to deliveries are also a reality outside the academic world. For support in the development of solutions, Embrapa experts accompanied and supported the participants with information from the agricultural research (Figure 2).

Photo: Márcio Marco Ashford



Figure 2. Orientation of the teams participating in the *Embrapa National Academic Hackathon* 2017, organized by Embrapa Roraima in Boa Vista, RR.

Interactive mobile games on Integrated Pest Management; a character who becomes ill and needs to consume more vegetables to raise his well-being and his level of happiness; biofuel truck produced from corn, soybeans and sugarcane; and tips on how to grow vegetable crops through the hydroponics method are some examples of the results achieved in the edition of *Hackathon* in Brasília (Guaraldo, 2017).

Anyone who thinks that technology has nothing to do with the plain areas of the Amazon estuary is wrong. A group of young information technology students presented an application that optimizes the production of the native acai plantations of the region and took the first place in the marathon in Belém,

PA, which was named *Hackathon Acadêmico – Desafios para o Açaí* (*Academic Hackathon – Challenges for Acai*) (Lima; Braga, 2017).

In Seropédica, RJ, the theme of the stage was *Mobile solutions for sustainable production focusing on functional attributes of Atlantic Forest plants and conservative biological control*. The Döbereiner team – a name created to honor the scientist Johanna Döbereiner, one of the precursors of Embrapa Agrobiology –, formed by three information system students and one agronomy student, all of the Federal Rural University of Rio de Janeiro (UFRRJ) – was the winner. The team developed an application capable of guiding farmers and extensionists to choose suitable species for environmental restoration considering factors such as soil, terrain and drainage capacity (Bello, 2017).

In Boa Vista, RR, the Overflow team, made up of three electrical engineering students from the Federal University of Roraima (UFRR), won the top prize with the presentation of the Agronews application, which met the challenge of creating a mobile solution for broadcasting technological information and survey of research demands, the theme of *Hackathon* in the state. The intuitive and functional tool conquered the judging committee by presenting, besides the connectivity to the information of the Embrapa Portal, different access according to user profile (producer, merchant, technician, etc.). Another important feature was the possibility of forming networks of relationship and discussion around common themes to the various profiles (Rocha, 2017).

The TecAgro team of the Piauí Higher Education Association – Piauí University (Aespi-Fapi), from Teresina, was the great champion of the Piauí marathon with the automated Irrigation mobile application. The objective of the marathon was to assist technicians and producers in making decisions for the sustainability of agriculture and livestock using results of Embrapa research, benefiting society (Sinimbu, 2017).

As it can be seen, in addition to discovering what *Hackathon* is, now it is possible to know the benefits of this event: a step in the construction of a new organizational culture focused on innovation, a stimulus for collaborative work (open initiatives) and the vision of interconnecting teams, which invigorates and inspires professionals.

Training of employes and associates

Since its creation, Embrapa has invested in the development and education of its employees and associates in order to acquire and improve knowledge.

From January to November 2017, through 872 agreements with education and promotion institutions spread all over the country, the Company provided training and preparation for the professional performance of 8,211 students in different levels of education (elementary, undergraduate and graduate), which were supervised by employees and directly experienced Embrapa's production process by participating in research projects and support activities. This investment provides the institutional approach and the collective construction of knowledge with the academic environment, as well as contributing directly to the training of future scientists in the country (since it is common to identify, among the current employees, a significant number of former interns or scholarship holders). In addition, at the time of the creation of Embrapa, the intense demand for the training of highly qualified professionals to compose its framework and overcome the scientific and technological challenges in the country culminated in the elaboration of a program to encourage long-term training (master's and doctoral degree). Since then, more than 3,700 employees have been trained in national and international centers of academic excellence.

In the last 2 decades, with the broadest offer in Brazil of *stricto sensu* courses and with Embrapa's policy of attracting researchers with a completed PhD course (88.5% of its researchers already have the degree), postdoctoral studies became an important action to maintain the excellence of the technical training of its employees. In accordance with Embrapa's internationalization actions, employees with a PhD have had the opportunity to improve themselves in the best international centers through partnership and technical-scientific cooperation actions, directing their academic training to the real research needs through the Programa de Capacitação Cientista Visitante (Visiting Scientist Training Program) in areas such as: animal nutrition, plant and soil science, plant biodiversity and biotechnology. These guidelines are reflected in the increase in the number of completion of this type of training, which reaches 461, and in the visibility of Embrapa in the international scenario. In addition, in 2017, there were 289 Embrapa employees participating in technical-scientific events abroad to update knowledge in the United States, Canada, France, the Netherlands, the United Kingdom, Germany and Colombia. Over 3,000 employees are also trained annually in short courses in the country focused on the development of specific skills needed for professional performance. All these initiatives affect the improvement of institutional processes and increase its capacity to generate innovative technological solutions that meet the related demands of the Brazilian society.

Agriculture research and undergraduation and postgraduation

Embrapa encourages the accomplishment of internships and/or orientation for students of high school, undergraduate and postgraduate (specialization, master's degree and doctoral degree).

The Company actively participates in the Programa Institucional de Bolsas de Iniciação Científica (Institutional Program for Scientific Initiation Scholarships – Pibic) and the Programa Institucional de Bolsas de Iniciação em Desenvolvimento Tecnológico e Inovação (Institutional Program for Initiatives in Technological Development and Innovation – Pibiti), both of the National Council for Scientific and Technological Development (CNPq), programs to promote new talents in all areas of knowledge and aimed at undergraduate students from higher education institutions (Figure 3).

Embrapa also has agreements with different higher education institutions to promote cooperation between institutions. Part of the employees work in teaching activities and advising theses, dissertations and work of course conclusion. Cooperation also takes place through the use of structures, such as laboratories, libraries, experimental fields and data processing centers for the elaboration of such works.



Photo: Maria Jose Ferreira Tupinambá

Figure 3. Students of scientific initiation programs of Western Amazon, in Manaus, AM, in 2015.

Events and spaces dedicated to the sharing of knowledge and technology transfer

Learning spaces, institutional programs dedicated to knowledge sharing, technologies transfer, and stimulation to the development of science are tools used to transfer technologies to the directly interested sectors, subsidizing the decision making by the farmers.

Events as learning spaces

The offer of courses contributes to the transfer of technologies to directly interested sectors, while events in the format of workshops are appropriate to establish a communication with the society on the development of science in the agricultural sector, providing space for interaction with the public.

Embrapa Caravan

Caravana Embrapa (Embrapa Caravan) was created as a strategy for technology transfer on the *Helicoverpa armigera* caterpillar throughout Brazil. Between 2013 and 2015, it covered 17 states in addition to the Federal District. *Helicoverpa armigera* is a caterpillar that surprised farmers and researchers for their destructive power, causing damage mainly to corn, soybean and cotton crops in several places in Brazil. Until the beginning of 2013, there were no records of the plague in Brazil; therefore, when the first reports appeared, the researchers thought to be a species of the same genus, *Helicoverpa zea*, known as corn-caterpillar.

After its correct identification, the Embrapa research team traced, in an emergency, strategies for the control and management of the caterpillar. Strategies were also drawn for the transfer of technology (training and qualification) on the subject. Thus, the hotspot on [Helicoverpa](#) and on [Helicoverpa](#) and soybean. Finally, *Embrapa Caravan* was created, during which Embrapa employees and partners from other institutions visited states where there was a record of caterpillar occurrence or potential introduction. The proposal was to provide guidance to producers and extensionists on the control of *Helicoverpa armigera* and other pests of economic interest (Figure 4).



Photo: Joseani Mesquita Antunes

Figure 4. *Embrapa Caravan*: training in Integrated Pest Management in Passo Fundo, RS, in 2013.

International training

The training of foreigners through technical cooperation is one of the instruments that Embrapa has used to support the development of agriculture in other countries. In this sense, several courses have been offered by different Embrapa Units.

In 2012, the *Agricultural Experimental Techniques Course* was the first Embrapa training outside Brazil, in Nampula, Mozambique. The objective of the course was to present Embrapa technologies developed in the Brazilian *Cerrado*. The event was supported by the Federal University of Goiás (UFG).

The *Curso Internacional de Produção Sustentável de Hortaliças (International Course on Sustainable Vegetable Production)* was carried out annually by Embrapa Vegetables from 1995 to 2017 for technicians from Portuguese-speaking African countries (Angola, Cape Verde, Mozambique and São Tomé and Príncipe).

Embrapa Cassava & Fruits offered, from 2001 to 2011, the *Production and Processing of Cassava* and *Tropical Fruit Production* courses for technicians from Angola, Cape Verde, São Tomé and Príncipe, Guinea Bissau and Mozambique. The partner agencies of Embrapa in the execution of the three courses mentioned were the Brazilian Cooperation Agency (ABC), the Ministry of Foreign Affairs and the Japan International Cooperation Agency (JICA).

Embrapa Maize & Sorghum and Embrapa Soybean offered in 2011 courses for technicians from 31 African countries on the corn and soybean crops included in the Brazil-Africa Platform for Technological Innovation for Food Security.

In 2017, young people from 14 African countries participated in the *Training in Propagation, Production and Processing of Cassava for Young Africans*, taught by Embrapa Maize & Sorghum. The initiative is part of the Youth Technical Training Program (YTTP), conducted by Instituto Brasil África (Ibraf), a non-profit organization focused on South-South cooperation projects with emphasis on Brazil-Africa. The countries represented were: Benin, Burundi, Cameroon, Côte d'Ivoire, Ghana, Malawi, Mozambique, Nigeria, Republic of Congo, Senegal, Sierra Leone, Tanzania, Uganda and Zambia.

The *International Training Course on Agroforestry Technology Systems* offered by Embrapa Western Amazon in 2015, in its fifth version, trained technicians from Colombia, Brazil, Ecuador, Peru and Venezuela to disseminate sustainable production technologies.

In 2017, a series of training programs carried out by Embrapa in several Brazilian states sought to meet the international technical cooperation project entitled *Formação de Técnicos Especializados em Agricultura, Pecuária e Silvicultura Tropical para o Desenvolvimento das Zonas Tropicais do México: Tecnologia de Produção e Certificação de Plantas para Viveiros Tropicais* (Training of Specialized Technicians in Agriculture, Livestock and Tropical Forestry for the Development of Tropical Zones in Mexico: Production Technology and Plant Certification for Tropical Nurseries). The courses aimed at transferring technologies to increase the competitiveness of cocoa, coffee, citrus, coconuts, rubber trees, palm oil and forests in the humid tropical region. Around 90 mexican technicians and researchers from the agrarian sciences participated in the training.

Technologies Showcase

Vitrine de Tecnologias (Technologies Showcase) was created in 1997 to open Embrapa doors to public visitation and to provide Brazilian society with a participative follow-up on the results and commercialization of its researches. Using an annual exposure methodology that maintains the main characteristic of crops in ornamental forms, the research results generated by Embrapa and partners with the dissemination of technologies that include machines, plants and animals are presented. The showcase allows the sharing of knowledge and

technologies not only with those who dedicate themselves to the business in rural areas, but also with all segments of the urbanized society.

Since 2000, the *Showcase* has been installed in both the Embrapa Units and in partner areas of the Sistema Nacional de Pesquisa Agropecuária (National Agricultural Research System – SNPA). A total of 41 events were held between 1997 and 2013, involving more than 1 million people, among producers, technicians, students (Figure 5), authorities and urban public, who were able to get to know and ask questions about the hundreds of technologies exposed and the work of Embrapa in its social mission to improve the people's quality of life. There were also active visits to some Embrapa Units.



Photo: Fabio Junho Felipe Sousa

Figure 5. Reception of high school students at *Amazontech 2008*, in São Luiz, MA.

Students perceive space as an environment that awakens their scientific spirit and participates in writing contests, the results of which are subsequently disclosed, awarded and published in Embrapa media. For university students, *Showcase* became an open-air laboratory, serving as a scenario for supervised internships, motivating interns to develop monographs and thesis.

National Science and Technology Week

The *Semana Nacional de Ciência e Tecnologia* (*National Science and Technology Week – SNCT*), under the coordination of the Ministry of Science, Technology, Innovations and Communications (MCTIC), is held every year since 2004. Its aim is to bring science and technology closer to the population by promoting events that congregate institutions in the whole country. Activities are carried out that stimulate and motivate the population to discuss science and to deepen their knowledge about the suggested topics (Figure 6).

The theme Science Feeding Brazil was chosen for the [13th edition of SNCT](#), focusing on the development of research and new technologies on food quality, human evolution and its relation with food, daily food and inclusion of vulnerable populations. Embrapa participated actively in the event and obtained important results, of which the following stands out:

- Restructuring, expansion and modernization of Embrapa & School Program within the Open Doors of SNCT (where research institutions

Photo: Fabiane Fenalti da Rosa



Figure 6. Students from the Municipal School of Basic Education Uilibaldo Vieira Gobbo, from Sinop, MT, participating in an experiment on the importance of soil cover during the *National Science and Technology Week* held by Embrapa Agrosilvopastoral in 2013.

allow guided visits to their structures), focused mainly on local schools. There are lectures and workshops that bring together, train and integrate students, farmers, technicians and professionals.

- Formation of new partnerships and projects that were born from the event.
- Participation in state fairs aimed at students of basic education, technical high school, elementary education and primary education, public and private schools. Promoting the dissemination and integration of Embrapa with students who, for the most part, are just awakening to the subject, but already knowing Embrapa as partner and prominent in the Brazilian agricultural development, related or not to the theme of the fair.
- Participation of booths, fairs, mini-courses, workshops, lectures and classes aimed at the target audience of SNCT, promoting a strong integration of Embrapa with the Brazilian population.

Observation and Demonstrative Units

The dissemination of knowledge and technological solutions to the productive sector requires facilities in the Decentralized Units or in production areas to support the demonstration of the results and to support the decision-making of the farmers.

Agroecological Little Farm

The Sistema Integrado de Produção Agroecológica (Integrated Agroecological Production System – Sipa), known as Fazendinha Agroecológica (Agroecological Little Farm), was established in 1993 in Seropédica, RJ. It represents a joint initiative of Embrapa Agrobiology, Empresa de Pesquisa Agropecuária do Estado do Rio de Janeiro (Agricultural Research Corporation of the State of Rio de Janeiro – Pesagro-Rio) and the Federal Rural University of Rio de Janeiro (UFRRJ), in order to exercise agroecological practices.

Little Farm currently has 79 ha, where the agroecological principles are applied, and the redesign of the landscape and the use of organic waste are recommended (Figure 7). From the integration of animal and vegetable production activities, the recycling of nutrients is guaranteed, especially through the use of manure from dairy cattle. No-till plantation and green manures are also used in soil

management, with emphasis on the use of legumes, which contribute to the nitrogen supply through the biological fixation process. The management of phytoparasites is mainly by prevention, through the integration of cultural practices in order to maintain the occurrence of diseases and pests at a tolerable level. Little Farm receives annually more than 1 thousand visitors, among farmers, technicians, extensionists and university students from Brazil and abroad.



Photo: Ana Lúcia Borges

Figure 7. Live cover of the soil with plant “cocktail” in banana trees in an organic system within the area of the Agrobiological Little Farm at at Embrapa Agrobiology, located in Seropédica, RJ.

In 2009, the Centro de Formação em Agroecologia e Agricultura Orgânica (Training Center in Agroecology and Organic Agriculture – CFAAO) was set up on Little Farm, where, in addition to the training, a professional master’s course in organic agriculture from UFRRJ was given in partnership with Embrapa Agrobiology. The master’s degree program began in 2010, having already trained 88 students from various Brazilian regions and institutions.

Organic Yards

The Quintais Orgânicos de Frutas (Organic Fruit Yards) project is coordinated and executed by Embrapa Temperate Agriculture and since 2004 has implemented more than 2,018 yards in the Southern Region of Brazil and Uruguay, reaching 60,701 direct beneficiaries. Financed by the Companhia de Geração Térmica de Energia Elétrica do Sistema Eletrobras (Eletrobras System Electric Power Termic Generation Company) and supported by Fundação de Apoio à Pesquisa e Desenvolvimento Agropecuário Edmundo Gastal (Edmundo Gastal Agricultural Research and Development Support Foundation – Fapeg).

Organic Yards contribute to the food and environmental security of poor communities in rural and urban areas, as it is aimed at family farmers, *quilombolas*, indigenous people and rural and urban schools. It focuses on various aspects of sustainability in addressing cultural, ethnic, environmental, food, educational, economic and medicinal issues.

The technologies developed in the project (such as the development of new cultivars, knowledge of the functional properties of the food that make up the yard and the process of verticalization or transformation and aggregation of value to food) contribute to the social inclusion of the beneficiaries and to enable the generation of employment and income. Each Organic Fruit Yard constitutes a Demonstration Unit or transfer of technology of the products, processes and services generated by Embrapa.

In 2008, the project was the winner of the 16° Prêmio Expressão de Ecologia (16th Ecological Expression Prize) in the Socioenvironmental Technologies category, which is the largest environmental award in the South Region. The project had already been recognized in 2007, when it received the Social Technology Certification from Fundação Banco do Brasil, in partnership with Petrobras and support from the United Nations Educational, Scientific and Cultural Organization (Unesco). Through the Organic Yards project, Embrapa Temperate Agriculture won the Finep Innovation Award 2009 in the Social Technology category. The project was also selected in 2016 to make up the Good Practices for Sustainable Development Platform, which is part of the cooperation program with the Food and Agriculture Organization of the United Nations (FAO) entitled Brazil-FAO International Cooperation.

Contents in multiple formats

The presentation of content in multiple formats contributes to the promotion and sharing of knowledge, transfer of technologies and stimulation to the development of science.

Contents developed for formal and non-formal education

Interactive books and web pages are among the various formats used by Embrapa for the promotion and dissemination of science content in the agricultural sector for society, especially at elementary and high school levels.

School atlas of the Metropolitan Region of Campinas

In 2008, Embrapa Satellite Monitoring and the Education Department of the municipality of Campinas, SP, initiated a partnership with the purpose of elaborating the *Atlas Escolar da Região Metropolitana de Campinas (School Atlas of the Metropolitan Region of Campinas)* (Figure 8) (Criscuolo, 2016) and developing methodologies for the construction of didactic material customized from geotechnologies.

The atlas was built in an innovative way by inserting contents and concepts that should form part of the curriculum of the final series of elementary education guided by a main thematic axis: agricultural activities, both those that occurred in



Figure 8. Cover of the School Atlas of the Metropolitan Region of Campinas book: inductor of the technology transfer actions celebrated by the partners.

Source: Criscuolo (2016).

the past and contributed to the formation of landscapes as well as most current practices in the region. Such information, in general, is not part of the textbooks used in the classroom.

In the atlas, the public can find texts, data, maps, graphs and images of satellites with contents related to the municipality and the region where students live. Starting in 2014, the municipality of Campinas created a local program to encourage the use of the atlas in the classroom and to develop scientific research projects with elementary education students. This program, called Pesquisa e Conhecimento na Escola (Research and Knowledge at School – Pesca), has a platform for distance learning in which teachers interact with the management team. Throughout the year, students and teachers carry out group research, collect, systematize and process data and provide results and evaluate the items learned, identified as the main theme and object of study. Between 2015 and 2017, about 8 thousand students of the municipal education network were involved in the program and studied, from the atlas, various topics of local interest both in the surrounding regions of the school and in the neighborhood, municipality or region.

Sharing Science on the Web

Contando Ciência na Web ([Sharing Science on the Web – CCWeb](#)) is an on-line initiative of scientific divulgation directed to the children and youth audience that aims to inform in a playful way (Figure 9). To support this audience in their school learning process, CCWeb uses multimedia resources, seeking to be in tune with



Figure 9. Reproduction of the home page of the Sharing Science on the Web.

Source: Embrapa Informação Tecnológica (2017).

the technological reality where the new generations are immersed, especially the children and adolescents of the 21st century.

Through its games, texts, books, booklets, audios and videos, the site offers content that seeks to promote a culture of valorization of sustainable development and cultural diversity of Brazil. It is represented, for example, in the characterization of the characters, created exclusively for CCWeb: the little scientist, the future biologist, the Indian and the girl who want to be veterinarians, as well as the adolescent who wants to be an agricultural technician. The characters interact with researchers and a farmer in scenes that bring the context of research laboratories closer to the natural environment of a farm, helping the little web surfers to project themselves professionally. At the same time, CCWeb highlights the importance of combining scientific knowledge with sustainability and the preservation of nature.

Frequently consulted to support school research, the website is a source of pedagogical aid for the learning of the natural sciences, which, due to the language and resources used, it is particularly suited to the context of elementary education.

Training and contents for farmers, extensionists, technicians and university students

Training and content development are relevant initiatives to promote change. In addition to those already mentioned throughout this e-book, we must mention other actions developed by the Decentralized Units that contribute to sustainable rural development, such as:

- Zootechnical Residency, idealized by Embrapa Dairy Cattle.
- Training for cooperative technicians of the Organização das Cooperativas Brasileiras/Serviço Nacional de Aprendizagem do Cooperativismo (Organization of Brazilian Cooperatives/National Cooperative Learning Service – OCB/Sescoop), idealized through the partnership and executed by Embrapa Wheat.
- Partnership between Embrapa, Ministry of Education and National Council of Institutions of the Federal Network of Vocational, Scientific and Technological Education (MEC/Conif).

- Training for medium rural producers, promoted by the Projeto de Agricultura de Baixa Emissão de Carbono (Low Carbon Agriculture Project – ABC Cerrado Project) (partnership between Embrapa, World Bank, National Rural Apprenticeship Service and Ministry of Agriculture, Livestock and Food Supply).
- Building of tools such as information systems, which are important means for capacity building, for the dissemination of research results and technologies, for use in teaching and research projects or as a tool for rural planning.
- Sistema de Informação de Solos Brasileiros (Brazilian Soil Information System – SiSolos), which was developed through a partnership between Embrapa Agricultural Informatics and Embrapa Soils. The system aims to store, manage, recover and make available information on Brazilian soils. The database gathers information on physical, chemical and mineralogical analyzes of soils from all regions of Brazil accessed on the internet. Based on this database, applications can be developed to aid decision making in agribusiness, in areas such as: agricultural zoning, crop productivity estimation, mapping of soil properties, and subsidization for teaching and research projects, in addition to other uses. Currently, the database contains 220 registered research projects and about 8,800 soil profiles. The database is constantly updated, being continuously fed by researchers from Embrapa and representatives of partner institutions.

Final considerations

Embrapa initiatives presented in this chapter aim to promote education, entrepreneurship and knowledge sharing for different audiences and in different ways, always with a focus on sustainable rural development.

The knowledge generated in agricultural research must be available quickly for the whole of society and, in particular, must be available for teachers to use in the teaching-learning process and in the training of Brazilian citizens from elementary, secondary, technical and undergraduate education, including in agrotechnical and family agricultural schools (based on the pedagogy of alternation) throughout Brazil. Embrapa develops several strategies to raise awareness and train multiplier agents, such as offering physical spaces for interaction with science and educational practices based on contents and materials related to the agroenvironment.

Several instruments have been developed and used, some of which privilege the direct and practical contact with the technology developed, the learning by doing. Other instruments are readily available for use in teaching and research projects, or for use as a rural planning tool. All these instruments present themselves as contributions to change the Brazilian rural scene, focusing on the expansion of the well-being of rural communities and the generation and incorporation of technologies capable of promoting sustainable rural development.

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