

## LIFE ON LAND

### CONTRIBUTIONS OF EMBRAPA

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Michelliny Pinheiro de Matos Bentes  
Yeda Maria Malheiros de Oliveira  
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Technical Editors





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



**Sustainable Development Goal 15**

**LIFE ON LAND**

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## Chapter 10

## Future challenges

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### Main advances

As a leader in the transformation of Brazilian agriculture over the last 45 years, the Brazilian Agricultural Research Corporation (Embrapa) has dedicated itself to producing viable research, development, and innovation (RD&I) solutions in order to overcome challenges for the development of products, technologies, and knowledge to ensure the sustainable use of Brazilian biomes (Embrapa, 2015). Thus, the protection, recovery and promotion of sustainable use of the terrestrial ecosystems are crystallized in its mission. Embrapa RD&I actions have contributed for Brazil to meet the 17 Sustainable Development Goals (SDG) based on the eight Millennium Development Goals (MDG).

Its experience over almost half a century has paved the way for Embrapa's international recognition and presence, and turned it into a world-class company. Over this time, Embrapa met the great challenge of integrating agricultural research with social development, conservation and sustainable use of natural resources from different Brazilian ecosystems, in alignment with agreements and global policies towards poverty reduction and sustainability assurance. The effective attendance of the Company's researchers in discussion groups in preparation for international forums, in Brazilian delegations that subsidized negotiations of conventions on climate, biodiversity, desertification, and in the United Nations Forum on Forests substantiated these commitments of Embrapa. This participation has been important, since the technical-scientific perspective contributes to qualifying diplomatic decision making.

### Main challenges

Different ecosystems are vital spaces for the development of economic activities and for human survival. However, these ecosystems are also vulnerable primary

targets for global transformations of all kinds. Future scenarios regarding political and social areas, the use of natural resources, climate changes and increasing challenges in biological, food safety, and agricultural defense areas, and with the purposes of interacting with the international community and understanding such transformations, Embrapa opened virtual laboratories (Labex) abroad. Those located in Europe, United States, China, and Korea aim to foster geographical integration and North-South cooperation; and those in Africa (Gana) and Latin America (Venezuela) aim to foster geographical integration and South-South cooperation. As Embrapa outposts, the Labex have already organized and taken part in several projects.

For the future, it is expected that integration among researchers, through global research networks such as the International Union of Forest Research Organizations (IUFRO), will be improved, since the technological means for that are available. IUFRO, in partnership with Embrapa and the Brazilian Forest Service (BFS), is organizing the *XXV IUFRO World Congress*, to be held in 2019 in Curitiba, PR, Brazil.

In Embrapa latest competitive processes, some projects gained room in social networks and different platforms and apps dedicated to scientific discussion. Live and virtual meetings as congresses and workgroups also make it easier to exchange information and knowledge, which are increasingly compartmentalized and complex. The continuous participation of Brazilian researchers in international discussions on the future of agricultural and forest research only will be possible if their direct and frequent attendance in discussion forums, the publication of impressive works, and the organization of consistent teams are maintained.

Brazil is a key country because it is home to one of the biggest and most important biodiversity repositories on the planet, and because it manages its forests in accordance with strict regulations. Its efforts to develop and adopt public policies that combine environmental protection with the development and reduction of social inequalities shall be expanded, so as to ensure the availability of resources for future generations. The sustainable forest management of Brazilian biomes encompasses these concerns, and the advances obtained through research shall not be restricted to supporting the design of standards and technical guidelines; they shall effectively help broaden the population's access to technological innovations developed for improving their means of living, which directly rely on the use and management of natural resources to the benefit of all society. In this sense, Embrapa took an important step, for example, in sponsoring the Projeto Especial Soluções Tecnológicas para a Adequação da Paisagem Rural ao Código Florestal Brasileiro (Special Project Technological Solutions for the Adequacy of



the Rural Landscape to the Brazilian Forest Code), which resulted in a publication on the Internet entitled *Forest Code: Contributions for the Adequacy of Rural Landscape*, which discusses concepts and offers guidance on PPAs, LRAs, and RUAs, different biomes and vegetation of Brazil. It is expected that this webpage will be increased to include, in the future, other solutions, protocols, and models developed by Embrapa researchers and partners.

Within the Forest Code, there is also the opportunity to broaden the property management concept (including the management model for each landscape), once the areas already mapped by the Cadastro Ambiental Rural (Rural Environmental Enrollment – REE), a system managed by BFS, one of Embrapa's partners, have already been disclosed. Models for resource management from this new perspective, which surpasses farm gates, are under development by Embrapa.

Contributions of Embrapa to the development of environmental regularization programmes (ERP) set forth in the New Forest Code should also be considered as opportunities. ERP is the set of actions or initiatives that farm owners and tenants should take to adapt and achieve environmental regularization. Each of the country's states shall implement its own state ERPs, and adapt them to the New Forest Code. This is a unique opportunity for Embrapa to consolidate its role as a solution supplier for rural properties, appointing models for the restoration of PPAs, LRAs, and RUAs, and species/origin for forest farming and ICLF projects.

Embrapa has also advanced considerably in the delivery of solutions for timber and non-timber product sustainable management, mainly in the Amazon and *Caatinga*. It is part of ongoing long-term research studies, whose results deserve attention. Along with an even higher commitment on studying these biomes, substantial efforts on *Cerrado*, whose landscape analyses would be very important, are also expected. Furthermore, protocols to demonstrate the possibility and feasibility of sustainable forest management in secondary forests and Brazilian pine planted forests in the Atlantic Forest biome scenario are also expected.

Therefore, an interdisciplinary involvement of research and technology transfer areas should be promoted as a means to improve strategic actions addressed to regional matters and challenges, such as those already established to increase agricultural productivity, to combat deforestation, land degradation, and to protect living organisms. Such activities may be performed by applying models for sustainable management, environmental restoration, and ICLF in Technological Reference Units managed in partnership between researchers and

technology-transfer experts and farmers. Furthermore, the appointment of native or alien species for afforestation or reforestation is a powerful instrument to promote forest cultivation in small or large properties, thus contributing to achieving the target established in negotiations at the *21<sup>st</sup> Conference of the Parties (COP 21) of the United Nations Climate Change Conference* in Paris, after which a new agreement aiming to strengthen the global answer to the threat posed by climate change was reached.

Among other commitments, Brazil will have to restore and reforest 12 million hectares of multiple purpose forests by 2030 by means of the so called nationally determined contributions (NDCs). This is a niche of great importance for Embrapa, whose experts on the matter are producing information on the adaptation of species to different ecosystems. A strong investment to strengthen this line of business is expected, including partnership with other institutions that could also be involved in providing environmental services. In this sense, the existence of degraded lands is one of the hardest challenges to achieve sustainability. Embrapa strategies for the future (Embrapa, 2015) embrace this challenge by stimulating its teams to improve generation, transfer, innovation, and validation of technologies aimed to revert scenarios of direct threat to biodiversity, food safety, and life on Earth.

The anthropogenic changes, which occurred more strongly in specific biomes and ecosystems, stimulated the development of plans and projects emphasizing sustainable management practices and valuation of ecosystem services. This shall be a strategy to make production and protection compatible in mountainous regions. The recognition of Local Productive Arrangement of Sheep and Tourism at *Alto Camaquã* and the geographical indications of wine territories at *Serra Gaúcha* are successful efforts. In Rio de Janeiro, the example comes from the Fluminense mountainous region. These examples could and should be repeated and adapted, but, above all, it is expected that the technical-scientific integration be a priority, because it is expert diagnosis that widens the exchange of experiences in mountainous regions. Thus, a massive attendance at *Mountains 2018* congress, to be held in Nova Friburgo, RJ, is expected. It is an initiative of the Food and Agriculture Organization of the United Nations (FAO) to gather governmental institutions and society to work for the sustainable development of mountain environments in the whole world.

In Embrapa, the search for and protection of threatened native species takes place in varied environments, such as inner continental waters (rivers, lakes), fields and natural forests. Strategies to protect national biodiversity depend on advancing the knowledge on issues related to the biology of species and their answers to

ongoing anthropogenic modifications. Thus, many technological solutions are being offered, such as reduction of fire use in the Amazon; zonings of land use; and development of software for timber forest management. Other initiatives are related to collecting materials maintained in herbaria, wood galleries, fruit galleries, and spermathecae. There are studies that contributed to elaborating public policies, so as to help avoiding extinction of threatened species, as are the cases of timber exploitation in the Amazon and of the maintenance of active germplasm databases.

For the future, initiatives gathering, in a network, experts on different scenarios and species to discuss the reduction of anthropogenic impacts on weakened areas are expected. Evaluating the tourist potential of certain areas and species, and valuing them as sustainability indicators for property certification and tax incentives seem to be options for the near future too.

It is worth emphasizing that, besides food production (*commodities*), farmers must be valued for trading ecosystem services (*non-commodities*) so as to continue preserving the region. Embrapa has been investing in studies for this purpose, for example, by organizing the research network named Serviços Ambientais e a Paisagem Rural (Environmental Services and Rural Landscape) and by releasing books and projects such as Bem Diverso (Diverse Asset), which aims to contribute to the conservation of Brazilian biodiversity in multiple use landscapes through the sustainable management of socio-biodiversity and agroforest systems (AFSs). It is a promising area that offers solutions closely related to other of Embrapa initiatives, which can be conducted with the aims of gathering contributions to specific ecosystems and, at the same time, addressing poverty reduction.

Alien animal and plant species always cause discussions and often distorted understandings regarding their importance for food safety and their threat to ecological balance. Because of their economic importance, alien species are largely used, and their uncontrolled spread shall be monitored using good practices defined by research projects and technical follow-ups. Monitoring systems (including, if possible, spatial information and strict certification processes) are the ideal instruments for managing invasive species. However, training people involved in field activities is vital to disseminate information on dealing with the landscape and environment. Technical documentation, such as booklets and folders, also contributes to spreading knowledge on management techniques and control of alien species with invasive potential. The organized civil society shall also access technical information based on scientific research.

The aspects mentioned in this chapter serve as landmarks for Embrapa to continue improving its processes and management tools, aiming to offer excellent support to both public and private sectors of society. In this process, Embrapa must focus on meeting the needs of society by establishing public policies for landscape and habitat conservation, which involve a permanent follow-up on the impacts and suitable practices for protecting biodiversity species in the varied biomes in Brazil.

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