SUSTAINABLE DEVELOPMENT GOAL 15

LIFE ON LAND

CONTRIBUTIONS OF EMBRAPA

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Technical Editors

Embrapa

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

Sustainable Development Goal 15

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Embrapa
Brasília, DF
2019

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1st Edition
Digitized publication (2019)

Cataloging in Publication (CIP) data
Embrapa

Life on land : Contributions of Embrapa / Gisele Freitas Vilela … [et al.], technical editors; tranlated by Paulo de Holanda Morais. – Brasília, DF : Embrapa, 2019.

PDF (120 p.) : il. color. – (Sustainable development goal / [Valéria Sucena Hammes, André Carlos Cau dos Santos] ; 15)

Translated from: Vida terrestre: contribuições da Embrapa 1st edition. 2018.
ISBN 978-85-7035-919-3

1. Sustainable development. 2. United Nations. 3. Agricultural production. 4. Ecosystems. 5. Technological solutions. I. Bentes, Michelliny Pinheiro de Matos. II. Oliveira, Yeda Maria Malheiros de. III. Marques, Débora Karla Silvestre. IV. Silva, Juliana Corrêa Borges. V. Embrapa. Intelligence and Strategic Relations Division. VI. Collection.

CDD 628.1

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Chapter 7

Endangered species protection

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Introduction

This chapter deals with the contributions of the Brazilian Agricultural Research Corporation (Embrapa) to achieve target 15.5 of the Sustainable Development Goal 15 (SDG 15) (United Nations, 2018): "Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species."

Embrapa is continuously improving in order to develop a sustainable tropical agriculture and contribute with strategic actions that increasingly associate and appreciate the use and conservation of the national biodiversity wealth. It also searches for solutions to minimize the losses and threats of species extinction in their natural habitats under degradation risks.

This action is closely related with the advance of knowledge on specific biology of species aspects and challenges to surpass the gaps, extending to the identification and comprehension of the effects caused by anthropogenic modifications on ecosystems. Thus, research, development, and innovation (RD&I) are being performed in order to know, characterize, and contribute, effectively, for the generation and adoption of technologies for sustainable use and conservation of natural environments and their species, in order to minimize the negative impacts of the anthropogenic actions causing these processes.

Embrapa germplasm active banks and genetic resourses of animals, vegetation, and microorganism systems include timber, flowers, fruits, seeds, forage plants and semen of wild animals. The maintenance of passport data, characterization, and appraisal of these systems are entirely aligned to the reference of access

and use of national genetic resources, and the treaties, agreements, contracts, and related proceedings, which are important indicators in the development of joint projects and actions to protect Brazilian biodiversity (Embrapa Recursos Genéticos e Biotecnologia, 2017).

In the future, these tools and proceedings application will be important to encourage the promotion of social and economic well-being in all Brazilian regions (Balanço..., 2015). In this regard, Embrapa develops its researches in partnership both with its Research Centers and with key-institutions to contribute for the elaboration of public policies and production of technologies to reduce vulnerability of threats arising from the environmental degradation, which deeply contributes to achieve target 15.5.

Some examples are the decreasing use of fires in the Amazon; several zoning systems suitable to Brazilian biomes (aiming a better territorial planning of land use); creation of softwares for agricultural, timber, livestock, and fishing sustainable management; and monitoring of native birds, bees, and wasps in different landscape scales.

This chapter presents a brief compilation of how Embrapa performes to comprehend and decrease the loss of habitats and biodiversity through its Research Centers located in all Brazilian regions.

Natural habitat degradation and biodiversity loss

Environmental degradation processes (such as deforestation, fires, predatory exploitation of timber, and hunt) and indiscriminate use of pesticides tend to isolate plant, animal, and microorganism populations, which reduces genetic variability and, consequently, the adaptive ability of species. Anthropogenic disturbance effects (changes in land use and fragmentation of natural habitats) from these actions decrease the biodiversity (Barlow et al., 2016), and contribute to the extinction of species in local, regional, and global scopes (Moura et al., 2014; Solar et al., 2015). Non-planned agricultural expansion also causes biodiversity loss. One of these negative consequences is the expansion of distribution of invasive species. Any of these effects can determine changes in important ecologic processes, such as the pollination and dispersion of seeds (Ferreira et al., 2012).

Endemism is considered in tropical regions when there is a degradation of singular habitats, in which disordered use of land promotes vulnerability or extinction of numerous species.

Degradation processes do not affect only terrestrial environments. They also affect the biodiversity of aquatic, rural, and savannah environments. They can be caused by soil erosion resulting from the changes of land use, interruption of water flows (Leal et al., 2016), predatory fishing, effects of chronic disturbances of anthropogenic origin in these environments, among others.

The Atlantic Forest is one of the Brazilian biomes with the most fragmentation of its natural landscape, due to the conversion of its forests in areas of agricultural production strongly based on the use of agrochemicals, resulting important changes in the interaction of biotic and abiotic components. Besides, these forest fragments work as barriers to the traffic of several animal species, acting as a subsequent threat to their conservation (Uzêda et al., 2016, 2017).

Disorderly forest exploitation became a typical example of the main causes of biodiversity loss all over Brazil. Particularly in the Amazon biome, where it became an important economic activity, there was a reduction of natural populations of several species of economic value, creating a comprehensive list of threatened or under extinction risk tree species (Martini et al., 1998).

Ex situ conservation of seeds is one way of minimizing the biodiversity loss in environments changed due to logging. However, for most tropical species, there is little information on ideal conditions of conservation and storage by means of this tool. Species such as the *acapu* tree (*Vouacapoua americana Aubl*.), *maçaranduba* tree (*Manilkara huberi*) and *ucuúba* tree (*Virola surinamensis*) (Figure 1) are some exemples with this limitation (Cruz, 2016; Cruz; Barros, 2016; Cruz; Pereira, 2016).

These barriers make conservation and reduction of habitat degradations difficult, which invariability require the production of seedlings, both to recovery of anthropized areas and to commercial reforestation.

The *Caatinga*, which has a significative vegetation diversity, is also one of the Brazilian biomes susceptible to threats of anthropogenic changes on its ecosystems. Among endangered native species, there is *cumaru* or umburana-de-cheiro (*Amburana cearenses*), which has an important medicinal and cosmetic potential, and the stingless bee (*Melipona subnitida*), which has an important ecologic-economic function due to the production of honey and crop pollination in conditions of confinement in northeast Semiarid region (Silva et al., 2014).

The Brazilian *Cerrado* is the second largest biome in the country, and one of the priority areas for biodiversity conservation and protection on the planet. However, failures in extensive cattle production in the region since the 1960s have been

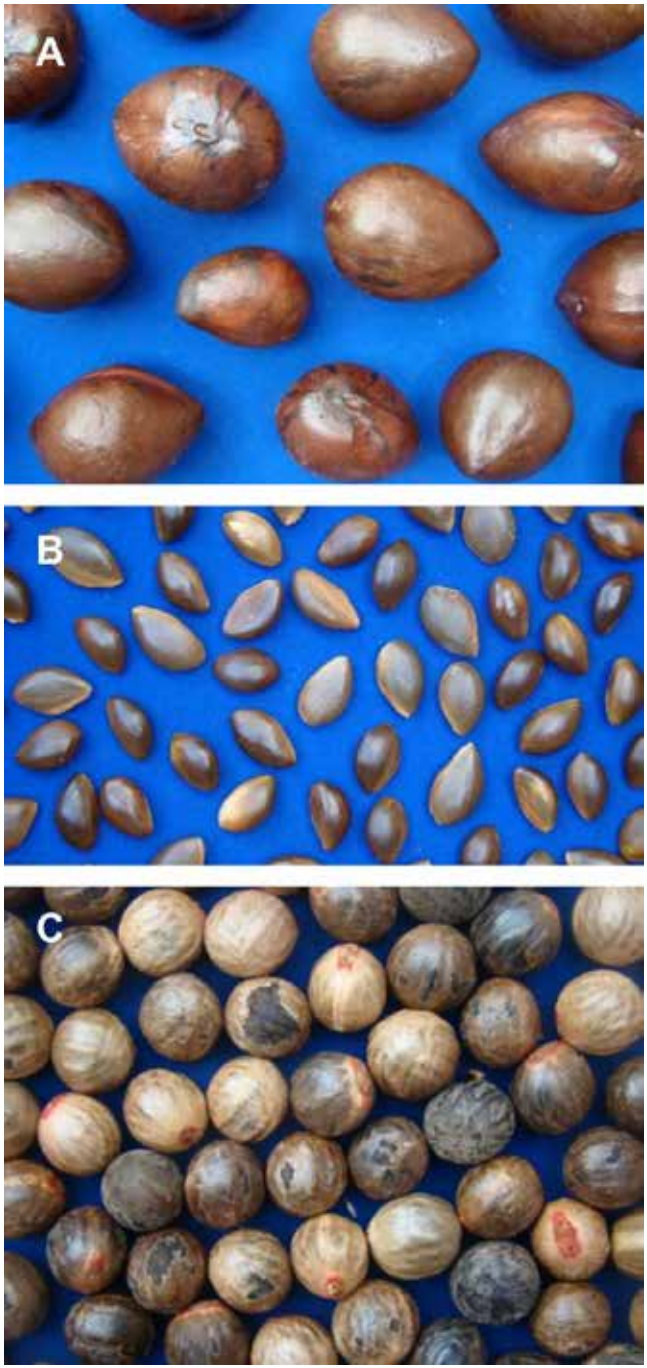

Figure 1. Seeds of Amazon species: *acapu* (*Vouacapoua americana* Aubl.) (A); *maçaranduba* (*Manilkara huberi*) (B); and *ucuúba* (*Virola surinamensis*) (C).

one of the main vectors of biodiversity losses, besides water and soil erosion, and degradation of its several types of vegetation.

The *Pampa* biome's biodiversity also suffered serious consequences due to the conversion of natural fields in other forms of land use. Its main characteristic vegetation is herbal-shrub vegetation types constituted by common hemicryptophytes, geophytes, and nanophanerophytes on surfaces of flat or gently corrugated terrain. One of the main consequences has been the infection of invasive species on natural fields.

In the *Pantanal* biome, one of the biggest challenges is to reconcile traditional management of livestock with biodiversity conservation and ecosystem services, once the region has diverse populations of threatened species both in national and global scenario (Harris et al., 2005). Lack of information determining threatened species status of conservation is one of the difficulties to protect them.

Animal species emphasized in Embrapa research in *Pantanal* are: giant otter (*Pteronura brasiliensis*), giant anteater (*Myrmecophaga tridactyla*), marsh deer (*Blastocerus dichotomus*), pampas deer (*Ozotoceros bezoarticus*), and southern three-banded armadillo (*Tolypeutes matacus*). In addition, it is included actions to halt the substitution of native pasture for exotic forages that increase productivity, since they can cause biodiversity losses and, in some situations, change the water flow. This is a serious common consequence to Brazilian biomes.

Endangered species protection

Embrapa has an important role in the promotion of economic growth and food safety in Brazil, which are topics society, has increasingly demanded. Thus, Embrapa research prioritizes the maintenance of germplasm active banks and compilations in the animal, vegetation, and microbial aspects to supply demands of genetic variability to improvement programs, especially those related to food safety (Gimenes; Barbieri, 2010; Albuquerque; Lanella, 2016).

Particularly in relation to endangered species (classified by international systems), studies on the diversity of native species have been consolidated, as an example, there is the conservation of Brazilian pine [*Araucaria angustifolia* (Bertol. (Kuntze)], pollination of Brazil nut [*Bertholletia excelsa* Humb. & Bonpl.] (Maués, 2002; Cavalcante et al., 2012; Maués et al., 2015) or reproduction of pirarucu (*Arapaima gigas* Schinz).

In some cases, Embrapa research strongly influenced public policies in favor of habitats conservation. These are some examples:

- Legislation guidance for timber exploitation that, as of decades of research in the Amazon region, encouraged the law for protection of mature secondary forests (Normative Rule No. 14/2015 of State Secretariat of Environment and Sustainability of the State of Pará).
- Assistance to the Ministry of Environment (MMA) in the evaluation of endangered species or groups of species in the *Pantanal* (Ibama, 1989, 1992; Brasil, 2014c).
- Collaboration in the elaboration and monitoring of the Plano de Ação Nacional para Conservação da Ariranha (National Action Plan for Giant Otter Conservation) (Brasil, 2014b) (Figure 2) and Plano de Ação Nacional para a Conservação dos Cervídeos (National Action Plan for the Cervid Conservation) (Brasil, 2014a) also in the *Pantanal* (Tomas et al., 2001, 2012).

Photo: Fabiano Aguiar

Figure 2. Giant otters (*Pteronura brasiliensis*) are subject of studies of Embrapa Pantanal researchers in subsidize to the National Action Plan for Giant Otter Conservation.

Embrapa has also carried out studies on the biology and populational of caimans (*Caiman sp*.) in the *Pantanal* biome (Mourão et al., 2000; Campos et al., 2006, 2014, 2015). This knowledge was used by the Centro Nacional de Pesquisa e Conservação de Répteis e Anfíbios (National Center for Research and Conservation of Reptilia and Amphibious – RAN) of MMA to elaborate a set of technologies called Sistema de Criação Semiextensiva do Jacaré-do-Pantanal (System of Semi-Extensive Pantanal Caiman Creation), which was expanded to other species in the Amazon biome.

The valuation of the socio-biodiversity products of different Brazilian regions are certainly the starting point of natural environments protection. Researches that valorize the use of such products and increase its aggregated use are improving, especially for the agro-industry production of Amazon tropical fruits, as acai (*Euterpe sp*.) – a food product with important demand in several Brazilian states –, and *Cerrado* native fruit species.

Several actions are being established for forest restoration of degraded environments. This is a significant strategy to restore biodiversity loss due to changes in land use occurring thoughout Brazilian biomes (Moraes et al., 2006; Sansevero et al., 2011). In this sense, Embrapa has promoted the consolidation of research networks approaching the theme of endangered species in a comprehensive and multidisciplinary way. Some approaches are: the search of solutions to halt biodiversity losses due to livestock in Brazilian biomes (Evaluation Project for Environmental, Economic, and Social Impacts of Cattle Production Systems in *Cerrado*, Amazon, and *Pantanal* — Avisar Project); emphasis on studies of important products of the socio-biodiversity for the support, food safety and generation of income to traditional populations (Environmental Service Arrangements in the Brazilian Rural Landscape); valuation of the use and conservation of non-timber species (Kamukaia Network); and the broad production of technical-scientific knowledge to subsidize the regional biodiversity protection (Sustainable Amazon Network) (Bentes-Gama et al., 2013; Ferreira et al., 2015; Prado et al., 2015; Wadt et al., 2017).

As an institutional strategy, it should be emphasized that Embrapa representatives should be included in international panels, seeking to evaluate the biodiversity status of the planet, its ecosystems, and essential services to human well-being. As example, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) and especially the thematic report on pollination, pollinators, and food production (Potts et al., 2016).

Approaching the multifunctionality of the rural landscape is one of the strategies of Embrapa research in the Atlantic Forest biome (one of the most fragmented in the country) to encourage management practices of control with ecological reinforcement, searching biodiversity conservation, ecosystem processes, and food safety (Uzêda et al., 2016, 2017).

Even in regions whose landscape is rather preserved, such as the *Pantanal* biome, initiatives of research promote the preservation of high-quality native pasture of these humid areas. The utilization of the natural aptitude of the *Pantanal* region for low-impact livestock and extensive areas of natural fields become, in this sense, opportunities for conservation of biological diversity in livestock farms and, consequently, rendered ecosystem services.

The impact evaluations of invasive species in the *Pantanal* and elaboration of measures for mitigation and control are a research priority (Oliveira et al., 2006). In the same way, distribution models of endangered species, such as jaguar (*Panthera onca*), cougar (*Puma concolor*), among other felines (Cavalcanti et al., 2012; Azevedo et al., 2016), are being developed by Embrapa. They aim the definition of areas with higher biological value (priority areas to establish public policies) and/or for compensation of conservation of landscapes and habitats in the *Pantanal* biome (Camilo, 2011) (Figure 3).

Techniques of molecular biology are making it possible for the Amazon endangered native species populations, such as acapu tree (*Vouacapoua americana* Aubl.), pau-amarelo tree (*Euxylophora paraensis* Huber), mahogany (*Swietenia macrophylla* King), cedro (*Cedrela odorata* L.), ucuhuba [*Virola surinamensis* (Rol. ex Rottb.) Warb.], Brazil nut (*Bertholletia excelsa* Bonpl.), maçaranduba [*Manilkara elata* (Allemão ex Miq.) Monach.], and cipó-titica (*Heteropsis* spp.), to be evaluated as for their degree of genetic variability. Thus, with the evaluation of bio-ecologic and genetic-behavior relevant aspects involved in the conservation of species it is possible to stop biodiversity loss. Embrapa also prioritizes the improvement of technologic processes aiming the adoption of best practices in production systems, as in the case of Brazil nut (Wadt; Silva, 2014).

In the Brazilian *Pampa*, the characterization, evaluation, and conservation of its rich biodiversity upon the management that evaluates agricultural, fruits, medicine, and field germplasm species of natural occurrence provides the biome ecosystem goods and services in the present, focusing on the future. In the *Cerrado* areas, Embrapa has emphasized actions of conservation and valuation of native species, which has contributed to the maintainance of the sustainable

Photo: Leonardo Nascimento

Figure 3. Collection of blood and ectoparasites from an ocelot (*Leopardus pardalis*) equipped with a GPS for its monitoring in *Pantanal* area.

life of rural communities located in the biome. In the same way, in the *Caatinga*, actions of research contribute to evaluating the economic potential of biodiversity, emphasizing native fruits and forage of multiple uses. It is worth mentioning imbu (*Spondias tuberosa*), an exclusive species of this biome that, besides to be used as food, is an alternative source of family income (A Embrapa…, 2017).

Embrapa has paid attention to the rich biological diversity of Brazilian biomes. They are directly connected to the need to protect and ensure the access of natural resources to all society both in the present and in the future. The national agricultural research is strategic to make Brazil advance in medium- and long--term policies and to contribute, effectively, to decrease degradation of natural habitats, biodiversity loss, and extinction of endangered species, to achieve the 2030 Agenda targets to the sustainable development.

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