

## Chapter 1

# SDG 15 in global and Brazilian scenarios, and in Embrapa scenario

Paulo Augusto Vianna Barroso  
Yeda Maria Malheiros de Oliveira  
Patrícia Póvoa de Mattos

## Global scenario

At the dawn of civilization, people's survival depended on mineral wealth and biodiversity. Up until nowadays, they are the basis of human existence on Earth. For too long, natural reserves were understood as endless, regardless of the way and the amount used. Over time, with the increase of the human population followed by the development of different sciences, evidence showing that resources are finite heightened.

Concern with environmental conservation seemingly exists since the beginning of the industrial era, but alerts to society on the risks posed by environmental vulnerability were marked by the publication, in the end of 1968, of an article titled *The Tragedy of Commons* in *Science* magazine by Garrett Hardin (Hardin, 1968). In 1972, the *Conference on the Human Environment* took place in Stockholm, Sweden, sponsored by the United Nations (UN). Thus, the theme became part of UN's scenario under the Food and Agriculture Organization (FAO). In 1983, the World Commission on Environment and Development (WCED) was created. In 1987, WCED published a report called *Our Common Future*, also known as *Brundtland Report*, which was historically very important, because in it was coined the term "sustainable development", which is undefeated until now to appoint "[development] that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Report..., 1987, p. 16).

A cornerstone in the environmental scenario was *Eco-92 (United Nations Conference on Environment and Development)*, in 1992, when the [Earth Charter](#), the [Forest Principles](#), and [Agenda 21](#) were disclosed, and the three great global summits on climate, desertification, and biodiversity were created. Each one of these summits started to organize meetings and discussions involving experts with the purpose of seeking both consensus among the countries and strategies to reduce and mitigate the negative effects of anthropization. In 2000, the UN

established, with the support of 191 nations, the Millennium Development Goals (MDG). Also in 2000, the United Nations Forum on Forests (UNFF) was created based on the *Forest Principles* and on *Agenda 21*. In 2007, the forum adopted the *Non-Legally Binding Instrument on All Types of Forests*. Recently, at the 21<sup>st</sup> Conference of the United Nations Framework Convention on Climate Change, which took place in Paris in 2015, leaders of 193 of UN's member states approved the adoption of Agenda 2030 and the 17 Sustainable Development Goals (SDG).

## National scenario

Brazil is a mega-diverse country. This means it has a biological variety far above the average of other countries. FAO's estimates suggest that Brazil has 20% of the planet's biodiversity and 30% of its rainforests (Indústria Brasileira de Árvores, 2017). Although there is room for more balance, the country is implementing actions related to preservation, environmental conservation, and reduction of the impact of human activities on the environment.

As an answer to important environmental questions, Brazil currently has areas assigned to preservation in a significant part of its territory. Parks, national forests, indigenous areas, and lands that belong to the federal government cover approximately [45% of the national territory](#). Besides areas expressly assigned to the maintenance of biodiversity, significant percentages of agricultural areas are also assigned to preservation. By act of law, farmers are obliged to preserve between 20% and 80% of the area of their properties which are covered by native forest, and they are responsible for both conducting a rational and suitable exploitation of their main means of production (land) and its natural resources, and looking after the preservation of the environment in order to promote general well-being (Figure 1).

Recent estimates of areas destined for environmental preservation in rural properties indicate that [farmers protect 25.6% of the national territory](#) (Miranda, 2018). This means that contributions and financial efforts are made not only by the Brazilian government, but also by the Brazilian society, with a strong contribution of farmers. Furthermore, forestry companies are aligned with the proposition of keeping Permanent Preservation Areas (PPAs) and Legal Reserves according to the law. All these efforts also contribute to maintaining areas with native forest remnants. For each hectare of planted forests, an area of 0.7 hectare is destined to preservation or conservation. Almost 14% of the 50 million hectares of natural habitats preserved in Brazil in conservation units are under the responsibility of

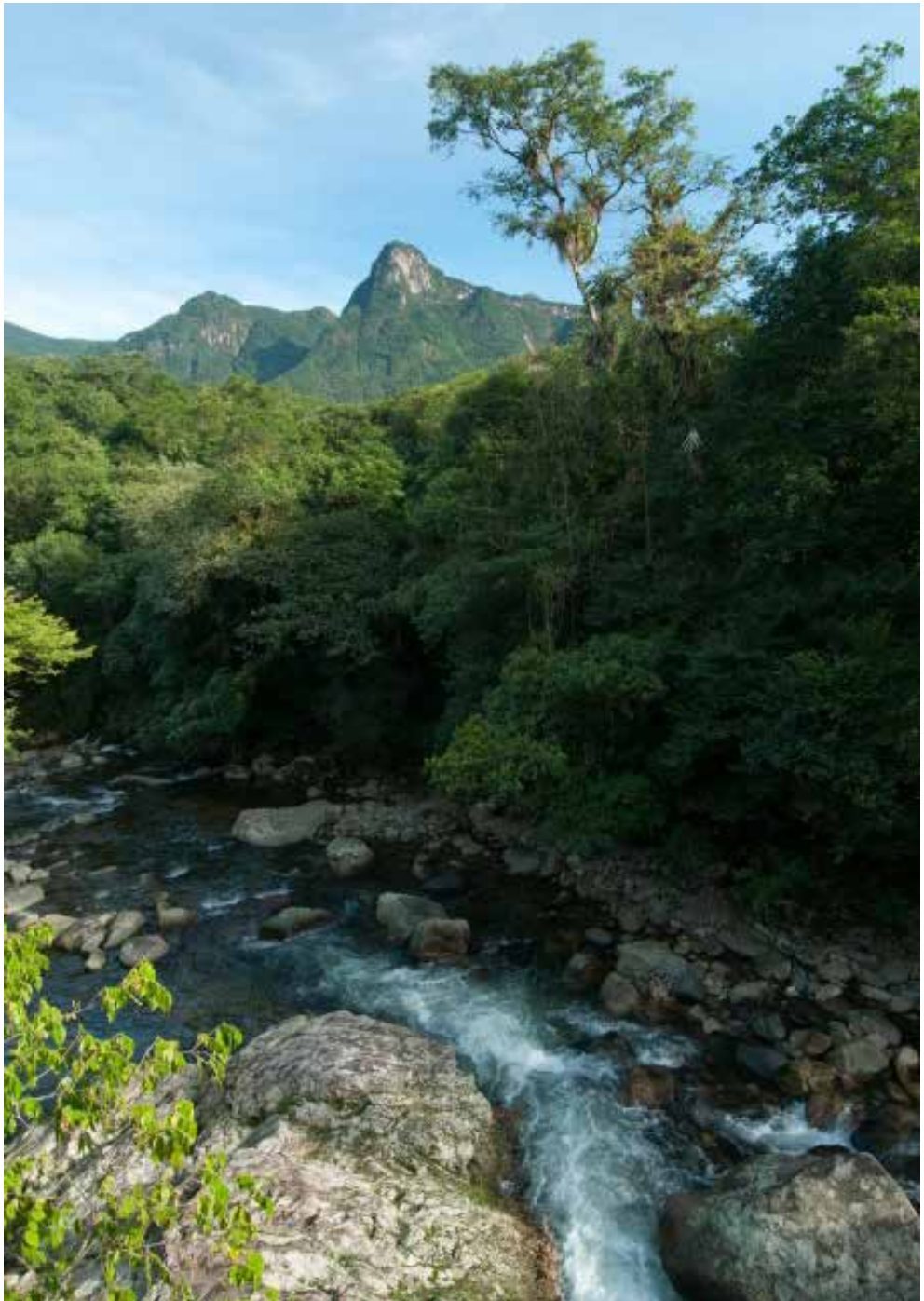


Photo: Zig Koch

**Figure 1.** Part of the Atlantic Forest preserved closely to River Mãe Catira, Paraná.

the forest sector, according to the 2017 annual report produced by the Brazilian Tree Industry (Ibá) (2017).

Caring for the existent biodiversity in Brazil would already be a massive job, once more than 65% of the territory is destined to preservation (Miranda, 2017). But the efforts do not stop there. Policies of access control and incentives to the sustainable use of biodiversity were also implemented and contribute decisively to make Brazil a country concerned with the preservation of native biodiversity and with its sensible use for the benefit of humanity (Figure 2). Even so, there are many knowledge gaps due to the great abundance of species, environmental diversity, and damages caused by the inappropriate, not sustainable use in the long run.



Photo: Diva da Conceição Gonçalves

**Figure 2.** An example of agricultural diversity: an agroforestry system constituted by banana (*Musa* sp.), beans (*Phaseolus vulgaris*), and rubber tree (*Hevea brasiliensis*) at the Chico Mendes Extractive Reserve, Brasileia, AC.

Therefore, within the Brazilian context, governmental and non-governmental agencies, companies, and the organized society recognize the importance of the forestry component to guarantee the quality of rural and urban life. Many of these entities act to ensure the continued positive role of forests.



## Embrapa scenario

The purpose of increasing food productivity, allied to the concern and need to ensure environmental conservation, has motivated Embrapa researchers and partners, since the Company's creation in 1972, to enable technological solutions in different agricultural production chains.

In accordance with the increasing demands for information on the forestry component, and focusing on the generation of products and on the promotion of environmental conservation services, the Programa Nacional de Pesquisa Florestal (National Program on Forestry Research) was created in 1978 and encompassed *Caatinga*, *Cerrado*, Amazon, and the Southern-Central region. Research teams devoted themselves to regional priorities (from management of natural forests to subjects like testing species introduction), approaching genetic improvement, forest protection, silviculture and management of native and introduced species, among others.

Thus, during its 45 years, Embrapa has offered solid contributions for the protection, restoration, and use of biodiversity. There has always been a widespread concern on the conservation of the diversity of animals, plants, and native and naturalized microorganism species in germplasm databases.

Maintaining the genetic variability of Brazilian biomes is a widespread activity in Embrapa units. Hundreds of thousands of samples of plant species and samples of animal sperm and egg cells are stored under special conditions, thus enabling their viability for longer terms, in the Basis Collection maintained by Embrapa Genetic Resources & Biotechnology (Figure 3). All samples are duly catalogued and kept under conditions that ensure the safety of heritage, so important for Brazil and the world.

Surely, a mere stock of accesses is not enough. Knowing the real value of each sample is important. Therefore, there is a careful work within the Active Collections of Germplasm (Figure 4); a conscious genetic and phenotypic characterization of the accesses is made, identifying what makes every single sample unique. The Basis Collections are not only the entrance door for new samples (which is ensued by collection, donations, and exchange), but also the exit door both to restore a lost variability for traditional communities and to improve germplasm collections of other agencies. Finally, there are Work Collections or Geneticist Collections, which are the ones used by Embrapa itself to make products that impact the Brazilian people daily. The Work Collections are directly related to breeding

Photo: Ana Cristina dos Santos



**Figure 3.** Collection of cassava (*Manihot esculenta*) samples.

Photo: Claudio Bezerra Melo



**Figure 4.** Embrapa Gene Bank.

programs, which manage diversity to generate new cultivars, and consequently products with better quality, higher productivity and lesser risks.

Embrapa research endeavors to improve cultivation systems and agroforestry systems also impact directly the conservation and use of biodiversity. Embrapa develops cultivation systems that are in permanent evolution to become more efficient under economic, social, and environmental perspectives. Hence, these systems increase the sustainability of agricultural activities and reduce the need for incorporation of new areas for agriculture. The Crop-Livestock-Forestry Integration System that Embrapa and its partners have developed is an important example, as well as the Agroforestry Systems and techniques for sustainable forest management.

The continuous work of collecting, profiling, breeding, and managing also enabled that some species with agricultural potential, but not adapted to a given agricultural environment, were better exploited. Some species (such as Brazilian nuts, *Bertholletia excelsa*) were bred to become more suitable to extractive management processes. Others (such as bacuri, *Platonia insignis*) were subjected to an association of extractive management, which exploits materials that exist naturally, and domestication, by planting crops under intercropping or under single Agroforestry Systems.

Special emphasis should be given to the Company's strategy of developing protocols and models for the restoration of degraded environments and its huge 45-year effort to develop and offer technologies for higher productivity of planted forests. Recently, addressing a request of forestry companies and the society, Embrapa produced a [document](#) evaluating the environmental impacts of planted forests. Management and forest management have been themes in Embrapa research studies since 1978.

Embrapa researchers are active players in national and international discussions, and contribute with their technical expertise to Brazilian public policies as well as to solutions for themes discussed in different international forums, thus increasing international recognition of the importance of Embrapa production. Recently, Embrapa Territorial publication (Miranda, 2018), which [NASA](#) (USA) confirmed, provided important information showing that Brazil protects and preserves the native vegetation in more than 66% of its territory and cultivates only 7.6% of the lands. In other words, Brazilian farmers should improve production systems, continuing to contribute to the conservation, recovery, and sustainable use of ecosystems.

## References

HARDIN, G. The tragedy of the commons. **Science**, v. 162, n. 3859, p. 1243-1248, Dec. 1968. DOI: 10.1126/science.162.3859.1243.

INDÚSTRIA BRASILEIRA DE ÁRVORES. **Relatório 2017**. Available at: <[http://iba.org/images/shared/Biblioteca/IBA\\_RelatorioAnual2017.pdf](http://iba.org/images/shared/Biblioteca/IBA_RelatorioAnual2017.pdf)>. Accessed on: Dec. 10, 2017.

MIRANDA, E. **Tons de verde: a sustentabilidade da agricultura no Brasil**. 2. ed. São Paulo: Metalivros, 2018. 218 p.

REPORT of the World Commission on Environment and Development: our common future. Oslo: World Commission on Environment and Development, 1987. Available at: <<http://www.un-documents.net/our-common-future.pdf>>. Accessed on: Dec. 14, 2017.