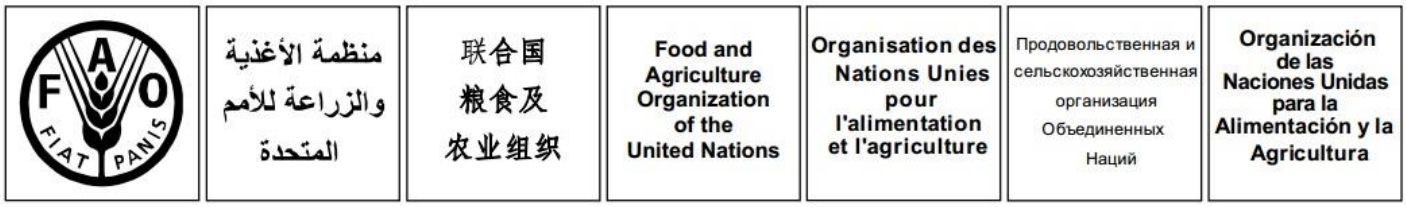


# Guidelines for the preparation of the Country Reports for *The State of the World's Biodiversity for Food and Agriculture*

**November, 2017**

**Guidelines for the preparation of the Country Reports for**
***The State of the World's Biodiversity for Food and Agriculture***

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THE ESSENTIAL ROLE OF COUNTRY REPORTS

The preparation of Country Reports is one of the most important steps in the process for preparing the first report on *The State of the World's Biodiversity for Food and Agriculture* (the SoWBFA Report), and will be critical in filling in gaps to existing information and establishing baseline information on biodiversity for food and agriculture, and on its role in providing multiple ecosystem services. The preparatory process of Country Reports should also be considered a strategic planning exercise and the report generated an overview of the country's sustainable management practices of biodiversity for food and agriculture and a tool for the assessment of national priorities and future needs to be addressed. Country Reports should also be seen as an opportunity to engage and stimulate the interests of a wide range of stakeholders from different sectors, and including smallholders.

The present Guidelines for Country Reports (Guidelines) aim to help countries to assemble baseline information and highlight the importance of a collaborative process, bringing together experts (including those stakeholders with experiential knowledge, such as farmers, pastoralists, forest dwellers and fisher folk) across sectors to assess available information and analyze gaps and needs. The Guidelines are also structured as a tool to guide data collection, planning and policy making at national level.

The Guidelines make a distinction between information countries may wish to provide in support to their own strategic planning, from the information needed for the preparation of the overall SoWBFA report. Countries may wish to draw upon documents prepared for the various sector State of the World's Reports for their cross-sectoral synthesis.

## I. INTRODUCTION

1. The FAO Commission on Genetic Resources for Food and Agriculture (the Commission) is the only intergovernmental forum which specifically deals with the whole range of genetic resources for food and agriculture. Genetic resources for food and agriculture are the building blocks of biodiversity for food and agriculture. The mandate of the Commission covers all components of biodiversity for food and agriculture. To implement its broad work programme and to achieve its objectives through a planned and staged approach, the Commission adopted and subsequently revised and updated its Multi-Year Programme of Work (MYPOW).[1]

2. One of the major milestones of the MYPOW is the presentation of the first report on *The State of the World's Biodiversity for Food and Agriculture* (the SoWBFA Report) to the Commission's Sixteenth Regular Session (to be held in 2017) and the consideration of follow-up to the SoWBFA Report, including through a possible Global Plan of Action. The SoWBFA Report will also be a major milestone in the context of the United Nations Decade on Biodiversity.

3. The Commission requested FAO, at its Eleventh Regular Session in 2007, to prepare the SoWBFA report, for consideration at its Sixteenth Regular Session, following a process agreed

[1] CGRFA-14/13/Report, *Appendix I*, Table 1.

upon by the Commission.[2] It stressed that the process for preparing the SoWBFA Report should be based on information from Country Reports and should also draw on thematic studies, reports from international organizations and inputs from other relevant stakeholders, including centres of excellence from developing countries.[3]

4. The Commission stressed that the SoWBFA Report should focus on the interactions between sectors and on cross-sectoral matters, taking full advantage of existing information sources, including sectoral assessments. It also suggested that priority be given to key supplementary information not available in existing sources.[4]

5. The Commission acknowledged that the report's findings would be preliminary and incomplete in a number of areas and requested FAO to ensure that such information gaps would be assessed and highlighted in the report. It also requested FAO to include in the report lessons learned and success stories on the conservation and sustainable use of biodiversity for food and agriculture.[5]

6. The SoWBFA Report will provide a baseline analysis of the state of knowledge. Incompleteness and gaps in available information should be clearly identified and acknowledged and used to direct future assessments. In compiling information for their Reports countries should state clearly where information is not available on specific subject areas.

7. The present Guidelines for the preparation of Country Reports contributing to the SoWBFA Report present an overall approach and a set of objectives that can guide the preparation of Country Reports, the scope of the report and the structure that can be used, as well as an appropriate timeline and process for their preparation.

8. The Guidelines assist countries to provide information complementary to sector reports in order to address the following questions:

- What is the state of the conservation and use of biodiversity for food security and nutrition, ecosystem services and sustainability?
- What trends can be identified in the conservation and use of biodiversity for food and agriculture and in the effects of major drivers of change?
- How can conservation and use of biodiversity for food and agriculture be improved and the contributions of biodiversity to food security and nutrition, ecosystem services, sustainability and the improvement of livelihoods of farmers, pastoralists, forest dwellers and fisher folk be enhanced?

9. Major differences exist between countries with respect to the nature, conservation and use of biodiversity for food and agriculture. To provide baseline information, highlight knowledge gaps and to facilitate the regional and global synthesis of the information countries are therefore invited to follow the structure provided in the Guidelines as closely as possible in the preparation of their Country Report.

[2] CGRFA-11/07/Report

[3] CGRFA-14/13/Report, paragraph 14.

[4] CGRFA-14/13/Report, paragraph 14.

[5] CGRFA-14/13/Report, paragraph 15.

## II. OBJECTIVES OF THE GUIDELINES

10. These Guidelines have been prepared by FAO to assist in the preparation of Country Reports contributing to the SoWBFA Report. The Guidelines have been designed to assist countries to undertake a strategic assessment of their biodiversity for food and agriculture, with particular emphasis on components of biodiversity for food and agriculture that are not traditionally considered by the other sectoral assessments and yet contribute to the livelihoods of smallholder communities. These include uncultivated or wild food and non-food products, as well as species of importance to production systems.

## III. SCOPE, STRUCTURE AND CONTENT

### *Scope of the Country Report*

11. The scope of the Country Reports includes the variety and variability of animals, plants and micro-organisms at the genetic, species and ecosystem levels that sustain the structures, functions and processes in and around production systems, and that provide food and non-food agriculture products. A detailed description of the scope of the Country Report is provided in Annex 1. Production systems, as defined for the purposes of this report, include the livestock, crop, fisheries and aquaculture, and forest sectors (description provided in Annex 2).

12. The present Guidelines for the Country Report mainly focus on those areas not covered by sectoral reports, e.g. the biological diversity associated with different supporting and regulating ecosystem services within production systems or of importance to them, referred to hereinafter as associated biodiversity, as well as wild resources used for food. In addition to this, countries that previously presented or are currently preparing a Country Report on Plant, Animal, Aquatic or Forest Genetic Resources may wish to integrate information from these reports in the preparation of their Country Report for the SoWBFA.

13. The Guidelines should help countries to provide information from an ecosystem perspective, including on the provision of ecosystem services, and on the implementation of an ecosystem approach. They will also assist countries to report on the use of biodiversity for food and agriculture for food security and nutrition, rural livelihoods, sustainability and sustainable intensification as well as on relevant gender perspectives. In this way, the Guidelines will assist countries in describing the multiple functions and the multiple values to producers and users of biodiversity for food and agriculture.

### *Structure of the Country Report*

14. An Executive Summary is recommended, along with a section providing an Introduction to the Country, which would provide a description of the country and an overview of the different sectors.

15. Country Reports should follow as closely as possible the structure of the SoWBFA Report as presented in CGRFA-14/13/3 Appendix 1, which includes the following Chapters:

Chapter 1: Introduction
Chapter 2: Drivers of change
Chapter 3: The state and trends of biodiversity for food and agriculture

Chapter 4: The state of use of biodiversity for food and agriculture
Chapter 5: The state of interventions in the conservation and use of biodiversity for food and agriculture
Chapter 6: Future agendas for conservation and sustainable use of biodiversity for food and agriculture

16. An analysis of the different ways in which biodiversity for food and agriculture is used and supports cultural, social and economic values of local communities and traditional peoples will be an important aspect of the SoWBFA Report and of Country Reports. The Country Reports should therefore take full account of these aspects and seek the involvement of the widest range of stakeholders. In this respect, it is recommended that the scope of activities includes actions being taken by the public, private and nongovernmental sectors, and takes account of gender perspectives, and the needs, priorities and perspectives of indigenous peoples and local communities through their organizations.

## IV. TIMELINE AND PROCESS

17. In line with the overall process, as established by the Commission, the Director-General of FAO sent a Circular State Letter on 10 June 2013 to countries requesting them to identify National Focal Points for the preparation of Country Reports by November 30, 2013, and invited countries to submit their Country Reports no later than 31 December 2014.

18. The following steps are recommended in preparing the Country Report, using a participatory approach:

- Each participating country should appoint a National Focal Point for the coordination of the preparation of the Country Report who will also act as focal point to FAO. National Focal Points should be communicated to Ms Linda Collette, Secretary, Commission on Genetic Resources for Food and Agriculture (cgrfa@fao.org), by November 30, 2013**.**
- Countries are encouraged to establish a national committee to oversee the preparation of the Country Report. Given the cross-sectoral nature of the Country Report, the national committee should consist of as many representative stakeholders as practical (representing government, research and civil society) including from different sectors (fisheries and aquaculture, forest, livestock and plants) and those able to support analysis of associated biodiversity. It is recommended that the national committee also include a gender specialist along with someone who can contribute to economic issues, with a natural resource management, environmental economics, or other relevant background. It is recommended that within the 13 months countries are given for the preparation of the Country Report, the national committee meets frequently to review progress and consults widely with key stakeholders.
- The national committee may find it useful to establish cross-sectoral and inter-departmental/inter-ministerial working groups to compile data and information for specific sections of the Country Report, or to write specific chapters of the Country Report.
- The National Focal Point should coordinate the preparation of the first draft of the Country Report, which should be reviewed by the national committee. The National Focal Point should facilitate a consultative process for broader stakeholder review, including stakeholders from various ministries, departments, NGOs, research institutions, and stakeholders with experiential knowledge, such as farmers, pastoralists, forest dwellers and fisher folk, etc.

- Following the stakeholder review, the National Focal Point should coordinate the finalization of the Country Report, submit it to the government for official endorsement and transmit it to FAO in one of the Organization's official languages (Arabic, Chinese, English, French, Russian and Spanish) by 31 December 2014. The Country Report will be an official government report.
- If countries are unable to submit final Country Reports by the set deadline, preliminary reports of findings should be provided to FAO to contribute to the identification of global priorities for inclusion in the SoWBFA Report.

The FAO contact for the preparation of Country Reports is:
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## V. DETAILED METHODOLOGY AND GUIDANCE BY CHAPTER

The guidelines outline the suggested content and provide questions to assist countries to undertake their strategic analysis and develop each section of their Country Report. The questions are provided to facilitate analysis, to stimulate discussion and to ensure that the Country Report contains strategic directions that address priorities and needs. Questions that are critical to enable basic understanding of the conditions in your country and facilitate regional and global synthesis of the data and information collected are indicated in **bold**. Please try to ensure that data and information are provided for these questions wherever such information is available.

Questions are organized and formulated in relation to the production systems that are present in your country. Thus it is very important to fill in Table 1 in the Introduction to establish a list of production systems that will be used throughout the Guidelines.

## EXECUTIVE SUMMARY

**It is recommended that the Country Report contains an executive summary of 2-3 pages highlighting the main findings of the analysis and providing an overview of key issues, constraints and existing capacity to address the issues and challenges. The executive summary should indicate trends and driving forces and present an overview of the proposed strategic directions for future actions aimed at the national, regional and global levels.**

## CHAPTER 1: Introduction to the country and to the role of biodiversity for food and agriculture

***Proposed structure of the chapter and information to be included in the Country Reports***

The first objective of this Chapter is to present an overview that will help the reader appreciate the context for the Country Report by providing a general overview and summary of the features, demographics and major trends in overall biodiversity for food and agriculture in the country. Explicit attention should be given to associated biodiversity, ecosystem services and wild foods.

Countries that previously presented or are currently preparing a Country Report on Forest, Aquatic, Animal or Plant Genetic Resources, should be able to use some of the background information contained in these reports to prepare parts of their introductory section.

In this Chapter, countries will create a list of their different production systems that will be frequently referred to in subsequent chapters.

This chapter will seek information on the following topics:

- Basic information on the size and location of the country; its main physiographic and climatic features; human population;
- A synthesis of the current situation with respect to the current and potential contribution of biodiversity for food and agriculture to food security and nutrition, ecosystem health and sustainability of production systems, as supported by associated biodiversity and ecosystem services. Specific attention is also given to wild foods;
- Description of the different production systems within the country, as well as an overview of their importance to the national economy and rural livelihoods.

***Preparation of the Country Report***

**1. Provide a description of the process that was followed in preparing the Country Report, preferably providing the names (with affiliations and addresses) of the participants, including all stakeholders consulted, in an annex.**

- A elaboração do presente relatório foi coordenada pelos Ministério da Agricultura, Pecuária e Abastecimento e Ministério do Meio Ambiente, responsáveis pelo contato e mobilização das equipes nas demais instituições nacionais. Foram contatados

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- In addition to the research teams involved, a number of official documents, scientific papers and reports provided the basis for formulating the responses, as listed at the end of this document.

***General overview of the country***

**2. In a few paragraphs, provide a synthetic overview of your country, including the size, location, and main physiographic and climatic features. Include a section on human population, providing disaggregated data on women and men's contribution and involvement in agriculture. Briefly discuss as well the overall nature and characteristics of the economy, including the contribution of the different sectors. You may wish to draw upon the country overviews provided in the first chapters of previous and ongoing Country Reports on Forest, Aquatic, Animal or Plant Genetic Resources.**

- Brazil is one of the world's most mega-diverse country thanks to the extraordinary diversity of ecosystems and species existing within its borders. Brazil contains unique biological diversity and associated traditional ecological knowledge, that supports a large share of the world's food supply in a range of ecosystems that are global priorities for conservation. Due to the fact, that the biodiversity in Brazil is so vast, the use of these genetic resources is still scarcely explored, appreciated and conserved.

- Biodiversity is essential for agriculture. In a more general view, without it, pollination is affected, output falls with the poor quality of the soil, and the

water becomes more polluted. In Brazil, several rating scales can demonstrate this importance. Both at the ecosystem level and at agroecosystems, the importance of biodiversity has been highlighted. Although much of it is unknown, microbial diversity and its activity in soil has been studied in Brazil, including in degraded areas. The soil diversity is strongly affected by the location/type of use, but natural vegetation areas have shown greater richness and abundance of species than areas with human influence, demonstrating the impact of usage on this system component. However, more diverse systems of production such as Agroforestry Systems (AFS) potentially offer higher environmental services than those simpler ones (monoculture), because it has different components and extracts, thus being more efficient at converting energy into biomass and into organic matter for the soil. Similarly, no-tillage systems or systems that do not use burning have presented carbon stocks superior to conventional ones, also showing the benefits on soil biodiversity that may be seen both in quantitative and functional terms. Meaning the reduction of microbial biomass of the soils and its efficiency (increased in $CO_2$) have been associated with reduction of carbon in the soil, but alterations in key functional genes of the nitrogen cycle (nitrification, denitrification, ammonification) has also been associated with changes in land use.

- Many millions of small farmers, traditional populations and indigenous peoples explore the products from forests and savannahs that provide them with goods for subsistence and income. The rich flora and fauna are the source of an immense quantity of goods extracted from biodiversity, providing a safe net for farmers not only daily but also in times of scarcity. Despite its importance, this issue is still neglected and biodiversity contribution to people's livelihood is not properly computed and documented. The use and management of biodiversity by traditional and indigenous peoples contribute in most cases to its conservation and the maintenance of ecosystem services for the extractivism generally does not deplete the natural resources.

***Role of biodiversity for food and agriculture***

**Countries that previously presented or are currently preparing a Country Report on Forest, Aquatic, Animal or Plant Genetic Resources, should be able to use some of the background information contained in these reports to prepare this part of their introductory section. Detailed information on associated biodiversity, ecosystem services and wild foods will be provided in chapters 2, 3, 4, and 5 of the Country Report, and thus, countries may wish to consider developing this section after completing the main body of the Country Report.**

**3. Provide a summary of the role of biodiversity for food and agriculture in improving food security and nutrition, the livelihoods of farmers, pastoralists, forest dwellers and fisher folk, ecosystem health and sustainability of production systems in your country. Specific attention should be given to associated biodiversity, ecosystem services and to wild foods. The summary should also draw attention to the *ex situ* and *in situ* conservation of biodiversity for food and agriculture, the most significant aspects of use to improve food security and nutrition in the country, major changes observed in the last 10 years and the**

**main factors causing changes. Significant risks or dangers to the conservation and use of biodiversity for food and agriculture may also be highlighted.**

- The existing biodiversity in Brazil is exactly the fundamental point that makes the country one of the largest agricultural producers in the world. In its territory, Brazil is home to six different biomes: Cerrado, Amazon Forest, Caatinga, Atlantic Forest, Pantanal and Pampa. This biomes variety reflects the abundance of Brazilian fauna and flora, housing more than 20% of the total planet species. Besides that, many of the Brazilian species are endemic, and several plant species of global economic significance, such as pineapple, peanut and cassava, originate in Brazil. According to data from the Ministry of Environment (http://www.brasil.gov.br/cidadania-e-justica/2017/08/indigenas-representam-cerca-de-5-da-populacao-mundial), the country also is home to 305 indigenous ethnicities, as well as a large number of traditional communities such as quilombolas, caiçaras and seringueiros, which contains an invaluable amount of traditional knowledge on biodiversity use and conservation.

- Biodiversity occupies an important place in the national economy. Only the agricultural sector is responsible for a quarter of Brazilian GDP, producing food and commodities. The Brazilian agricultural research has international repercussions, especially in biotechnology development, which generates profits through the use of the components of biodiversity. Activities such as livestock and the production of soy, cotton, sugar cane and orange are responsible for much of the balance of the Brazilian trade balance.

- Another very important aspect is the production of vegetable biomass, including the production of sugar cane ethanol, firewood and charcoal from native and cultivated forests, which account for almost 30% of the national energy matrix. In the northeast, for example, these biomasses account for more than half of the industrial and residential energy demand. It is worth noting that, according to data from the ministry of mines and energy, the Brazilian energy matrix is composed of approximately 43% of renewable natural resources, compared to less than 3% in the world energy matrix.

- Regarding native biodiversity, currently, according to data from the Brazilian Biodiversity information System (SIBBr), in Brazil, 46457 species of plant and 117201 species of animals were identified, many of these used by the population in different regions of the country, for food, subsistence or commercial crops, for the recovery of degraded areas, honey production and increase of pollinator papulation, enrichment of legal reserve areas and a series of ecosystem services that directly and indirectly influence food and nutritional security as well as biodiversity conservation. According to data from the “Plantas para o Futuro” project, an initiative of the ministry of environment that aims the identification of native plants of current economic use or potential, more than 700 native plant species are directly used in food production and agricultural activities in Brazil. About animals, the range of native species use is still small, considering legal restrictions and the fact that many species are threatened with extinction.

Over the past few decades, various governmental and nongovernmental efforts have been focused on the implementation of priority actions for the conservation of biodiversity. Regarding in situ conservation, one of the main action guidelines was the creation of the National System of Conservation Units (SNUC), through law 9.985 of July 18, 2000. Currently, SNUC is composed of 959 Conservation Units, divided into 12 categories of use (http://www.mma.gov.br/images/arquivo/80112/CNUC_JUL17%20-%20B_Cat.pdf) and aims to generate income, employment, development and provide an effective improvement in the quality of life of local populations and of Brazil as a whole, in addition to conserving ecosystems and biodiversity.

- With regard to ex situ conservation, the Brazilian Agricultural Research Corporation (EMBRAPA) has, since the 1970's, research groups on ex situ conservation of genetic resources of plants, animals and microorganisms, working in the collection and exchange of germplasm, documentation and development of methods of ex situ conservation of genetic resources, in order to guarantee the physical, physiological and genetic integrity of the conserved collection, in addition to providing information associated with it.

- However, despite efforts to conserve Brazilian biodiversity, there are many threats to the maintenance of this national heritage. Among the main threats are: over-exploitation of natural resources; the disorderly expansion of urban areas over conservation areas; not observing good agricultural practices, with the increase in agrochemicals use and consequent increase of contamination of soil and water. The increase in deforestation, especially in Amazonian areas; the high number of agricultural areas with degraded and unrecovered soils; the forest fragmentation that results in diminution of native fauna; hunting and illegal exploitation of fauna in forest remnants; the disorderly replacement of areas of native forest by forests planted with exotic species; low volume of investments in human and financial resources for research aimed at biodiversity conservation and economic use of native species and associated biodiversity.

***Production systems in the country***

*IMPORTANT: Throughout these guidelines, questions on production systems will refer to the production systems identified in Table 1 as present in your country. When referring to them in your answers, please provide the production system code and/or the full name as found in Table 1.*

**4. Indicate, for each of the production systems listed in Table 1 below, whether it is found in your country or not (Y: yes, N: no), regardless of its importance. Detailed descriptions for each production system listed in Table 1 are provided in Annex 2.**

**Table 1.** Production systems present in the country.

| Sector | Code | Production system names | Present (Y/N) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Livestock | L1 | Livestock grassland-based systems: Tropics[6] | Y |
| | L2 | Livestock grassland-based systems: Subtropics[7] | Y |
| | L3 | Livestock grassland-based systems: Temperate[8] | Y |
| | L4 | Livestock grassland-based systems: Boreal and /or highlands[9] | N |
| | L5 | Livestock landless systems: Tropics | Y |
| | L6 | Livestock landless systems: Subtropics | Y |
| | L7 | Livestock landless systems: Temperate | Y |
| | L8 | Livestock landless systems: Boreal and /or highlands | N |
| Forests | F1 | Naturally regenerated forests: Tropics | Y |
| | F2 | Naturally regenerated forests: Subtropics | Y |
| | F3 | Naturally regenerated forests: Temperate | Y |
| | F4 | Naturally regenerated forests: Boreal and /or highlands | N |
| | F5 | Planted forests: Tropics | Y |
| | F6 | Planted forests: Subtropics | Y |
| | F7 | Planted forests: Temperate | N |
| | F8 | Planted forests: Boreal and /or highlands | N |
| Aquaculture and Fisheries | A1 | Self-recruiting capture fisheries: Tropics | Y |
| | A2 | Self-recruiting capture fisheries: Subtropics | Y |
| | A3 | Self-recruiting capture fisheries: Temperate | N |
| | A4 | Self-recruiting capture fisheries: Boreal and /or highlands | N |
| | A5 | Culture-based fisheries: Tropics | Y |
| | A6 | Culture-based fisheries: Subtropics | Y |
| | A7 | Culture-based fisheries: Temperate | N |
| | A8 | Culture-based fisheries: Boreal and /or highlands | N |
| | A9 | Fed aquaculture: Tropics | Y |
| | A10 | Fed aquaculture: Subtropics | Y |
| | A11 | Fed aquaculture: Temperate | N |
| | A12 | Fed aquaculture: Boreal and /or highlands | N |
| | A13 | Non-fed aquaculture: Tropics | Y |
| | A14 | Non-fed aquaculture: Subtropics | Y |
| | A15 | Non-fed aquaculture: Temperate | N |
| | A16 | Non-fed aquaculture: Boreal and /or highlands | N |
| Crops | C1 | Irrigated crops (rice): Tropics | Y |
| | C2 | Irrigated crops (rice): Subtropics | Y |
| | C3 | Irrigated crops (rice): Temperate | N |
| | C4 | Irrigated crops (rice): Boreal and /or highlands | N |
| | C5 | Irrigated crops (other): Tropics | Y |
| | C6 | Irrigated crops (other): Subtropics | Y |
| | C7 | Irrigated crops (other): Temperate | N |
| | C8 | Irrigated crops (other): Boreal and /or highlands | N |
| | C9 | Rainfed crops: Tropics | Y |
| | C10 | Rainfed crops: Subtropics | Y |
| | C11 | Rainfed crops: Temperate | N |
| | C12 | Rainfed crops: Boreal and /or highlands | N |
| Mixed | M1 | Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics | Y |

[6] Tropics: All months with monthly mean temperature, corrected to sea level, above 18°C.

[7] Subtropics: One or more months with monthly mean temperatures, corrected to sea level, below 18°C but above 5 °C.

[8] Temperate: At least one month with monthly mean temperatures, corrected to sea level, below 5 °C and four or more months above 10 °C.

[9] Boreal and/or highlands: At least one month with monthly mean temperatures, corrected to sea level, below 5 °C and more than one but less than four months above 10 °C.

| | | | |
|---|---|---|---|
| | M2 | Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics | Y |
| | M3 | Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Temperate | N |
| | M4 | Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Boreal and /or highlands | N |
| Others | O1 | Mixed forests | Y |
| Others | O2 | Organic systems | Y |
| Others | O3 | Extractive systems | Y |

**5. List in Table 2 the production systems that have been identified as occurring in your country in Table 1, indicating the codes and/or the names of the production systems as provided.**

Provide a description for each production system. Countries may wish to use the following criteria, where information is available:

Environmental features and characteristics:

a) additional information on climate (arid, semi-arid, humid, subhumid);
b) features of the landscape mosaic.

Rural livelihoods and sustainable use:

c) share of smallholders[11];
d) proportion of the production system found in urban or peri-urban context;
e) share of the population actively contributing to the production system disaggregated by gender, including number of employees if available;
f) importance of the production system to the incomes, livelihoods and well-being of rural communities;
g) levels of agricultural intensification and reliance upon synthetic inputs, modern varieties, fossil fuels, etc.

**Table 2.** Production systems present in the country.

| Code of production system | Name of production system | Description |
|---|---|---|
| L1 | Livestock grassland-based systems: Tropics | Traditional pasture: Cultivation of grasses (Jaragua, brachiarias) with low supply of inputs and/or investments. Low animal productivity.<br><br>Improved pasture: Cultivation of improved grasses (Brachiaria and other species) with rational allocation of inputs (animal and plant genetics, correction and mineral or organic fertilization of the soil) and/or |
| L2 | Livestock | |

[10] Note: in the various questions of the questionnaire, you may wish to provide data disaggregated by components for mixed production systems.

[11] Smallholder definitions are numerous and vary according to countries. Please refer to http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-6_Investing_in_smallholder_agriculture.pdf, pp. 23-24.

| | | |
|---|---|---|
| | grassland-based systems: Subtropics | investments (conservation practices) rotational grazing Good animal productivity. |
| L3 | Livestock grassland-based systems: Temperate | |
| L5 | Livestock landless systems: Tropics | It is an intensive system of production, used for the breeding of pigs, poultry (chicken or turkey) and fishes. |
| L6 | Livestock landless systems: Subtropics | |
| L7 | Livestock landless systems: Temperate | |
| F1 | Naturally regenerated forests: Tropics | The natural regeneration of forests has been verified in Brazil, mainly in the Amazon and Atlantic Rainforest Biomes. The Forest Remnants Atlas of the Atlantic Rainforest, which monitors the spatial distribution of the biome, identified regeneration of 2,197 km² between 1985 and 2015 in nine of the 17 states of the biome. The TerraClass Project of Amazon has identified the regeneration of 173,387 km² in the Amazon until the year 2014. However, since regeneration occurs also in public areas, most of these areas are not used for productive purposes. As Brazil still has large tracts of forested areas, the importance of regenerated areas as a source of income and livelihood is very small. But when it occurs is with a rational use and/or selective cutting |
| F2 | Naturally regenerated forests: Subtropics | |
| F3 | Naturally regenerated forests: Temperate | The Pampa is one of the most significant temperate forest formations in Southern Brazil. It occupies an area of 176.5 thousand square kilometers, with grassy and herbaceous vegetation. According to the Biodiversity Monitoring System of the Secretariat of the Environment and Sustainable Development of Rio Grande do Sul, there was a decrease of 4.3% in the last decade in the area of field remnants, forests and flooded areas in the Pampa. |
| F5 | Planted forests: Tropics | Forest of exotic or native species. For exotic species, it is generally established by clonal material for production of paper and cellulose. For native species, it is generally established with a non genetically improved material for timber products. |
| F6 | Planted forests: Subtropics | Forest of exotic or native species. For exotic species, it is generally established by clonal material for production of paper and cellulose. For native species, it is generally established with a non genetically improved material for timber products. |
| A1 | Self-recruiting capture fisheries: Tropics and subtropics | The most prominent example is with the native specie *Arapaima gigas* (common name pirarucu) in the Amazon river basin region. Other systems have been tested with small characins (*Astyanax genus*) and other exotic species in reservoirs. |

| | | |
|---|---|---|
| A2 | Self-recruiting capture fisheries: Subtropics | The most prominent example is with the native specie *Arapaima gigas* (common name pirarucu) in the Amazon river basin region. Other systems have been tested with small characins (*Astyanax genus*) and other exotic species in reservoirs. |
| A5 | Culture-based fisheries: Tropics | Very common practice in Brazilian reservoirs done by State governments. This is carried out with native and exotic species. |
| A6 | Culture-based fisheries: Subtropics | |
| A9 | Fed aquaculture: Tropics | Exotic and native fishes. E.g., tilapia (Oreochromis niloticus), tambaqui (Colossoma macropomum), pintado (Pseudoplatystoma corruscans). |
| A10 | Fed aquaculture: Subtropics | |
| A13 | Non-fed aquaculture: Tropics | Very common practice in Brazilian reservoirs and small/medium farms which livestock is the main activity. The byproducts (wastes) from livestock (e.g., swine) are recycled to become input for aquaculture species. |
| A14 | Non-fed aquaculture: Subtropics | |
| C1 | Irrigated crops (rice): Tropics | In Brazil, only rice is grown in an irrigated system. It covers a wide range of climates, both in the tropical and subtropical portions. It is a hygrophilous plant, requires soils saturated with moisture, preferably rich in organic matter (clay), humid and flat topography or with slight slopes to maintain the uniformity of the water sheet. The main system used is flooding and, to a lesser extent, sprinkler irrigation. |
| C2 | Irrigated crops (rice): Subtropics | |
| C5 | Irrigated crops (other): Tropics | |
| C6 | Irrigated crops (other): Subtropics | |
| C9 | Rainfed crops: Tropics | These crops in Brazil predominate in high lands soils with emphasis on the cerrado regions, being found in latitudes ranging from 5ºN to 33ºS. Soils in general are of low fertility (Oxisoils), requiring corrective fertilization and constant maintenance. Grains and fibers are grown mainly. |
| C10 | Rainfed crops: Subtropics | |
| M1 | Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics | Crop-Pasture: Production of crops (soybean, corn, rice, cotton), in rotation with pasture, without tillage, and with rational use of inputs, integrated management of pests and disease and control of traffic (Crop(No-Tillage)-Livestock Integration, meeting the basic premises of the No-Tillage System).<br><br>Crop-Pasture-Forest Integration: Production of crops (soybean, corn, rice, cotton), pasture and forest (Eucalyptus and/or other species), intercropped and integrated, without tillage, and with rational use of inputs, integrated |

| | | |
|---|---|---|
| M2 | Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics | management of pests and diseases and traffic control. (Crop-Livestock-Forest Integration), meeting the basic premises of the No-Tillage System. |
| O1 | Mixed forests | Ecological intensification of cultivation of Eucalyptus with nitrogen-fixing tree species. |
| O2 | Organic systems | Production system that adopts specific techniques, optimizing the use of available natural and socio-economic resources and respect for the cultural integrity of rural communities, aiming at economic and ecological sustainability, maximizing social benefits, minimizing energy dependence where possible, cultural, biological and mechanical methods, as opposed to the use of synthetic materials, the elimination of the use of genetically modified organisms and ionizing radiation at any stage of the production, processing, storage, distribution and marketing process , and the protection of the environment. |
| O3 | Extractive systems | Management and harvesting of non-timber products of native species usually carried out by traditional and indigenous populations. |

**6. Provide a map of production systems in your country, marking the places and regions mentioned in the Country Report.**

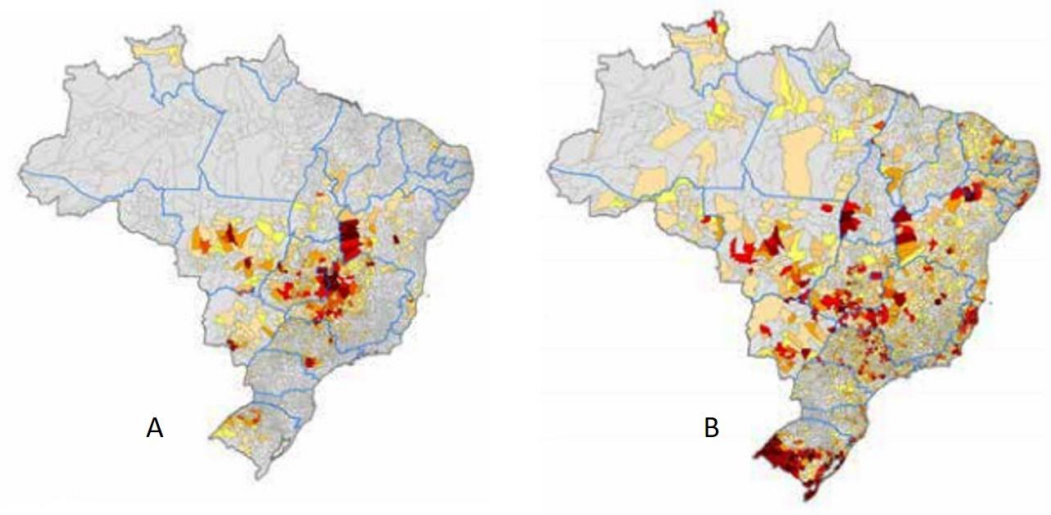


Fig. 1. Irrigated crops (other): Tropics. A) Pivot; B) Other systems. Fonte: Agencia Nacional de Águas (ANA).

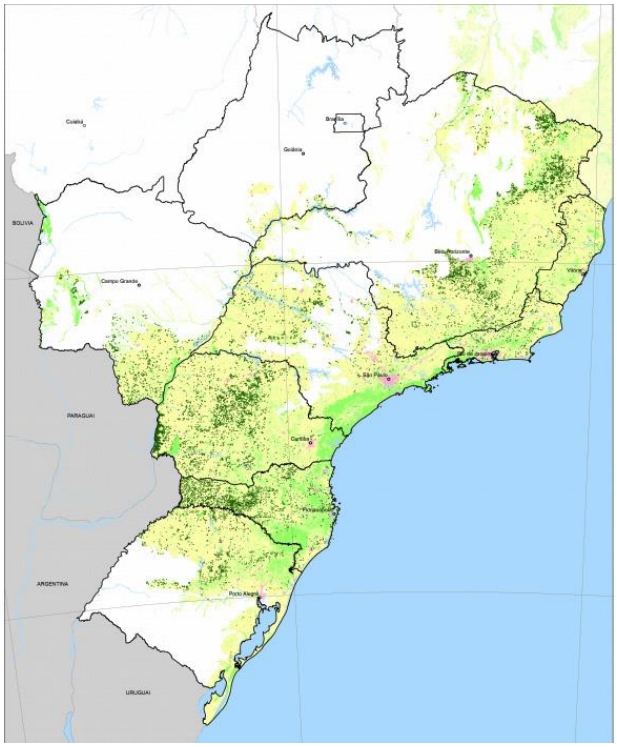

**Fig. 2.** Map of the forest regeneration of the Atlantic Forest between 1985/2015. Source: SOS Mata Atlantica.

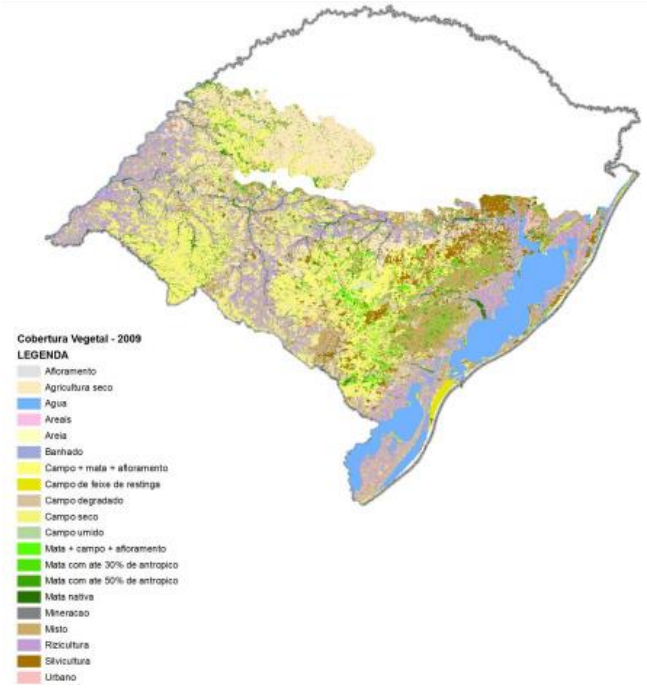


**Fig 3.** Naturally regenerated forests: Temperate. Source: Secretaria do Ambiente e Desenvolvimento Sustentável do Rio Grande do Sul, 2017.

**7. For each production system found in your country (refer to Table 1), indicate in Table 3 the area under production (km$^2$, hectares, acres, other). If not applicable, indicate the estimated production quantity (major products aggregated) using the appropriate unit or measure (tonne, head, inventory, cubic metre, etc.) for the production system. If available, indicate the contribution of the production system to the agricultural sector economy in the country (%). Please use the most recent data available and indicate the year of reference for the data or estimates. Specify NK if not known or NA if not applicable.**

**Table 3.** Area under production, production quantity and contribution to the agricultural sector economy for production systems in the country.

| Code of production system | Name of production system | Area (indicate unit) | Production – quantity (indicate unit) | Contribution to the agricultural sector economy (%) | Reference year |
|---|---|---|---|---|---|
| L1 | Livestock grassland-based systems: Tropics | | | | |
| L2 | Livestock grassland-based systems: Subtropics | | | | |
| L3 | Livestock grassland-based systems: Temperate | | | | |
| L5 | Livestock landless systems: Tropics | | | | |
| L6 | Livestock landless systems: Subtropics | | | | |
| L7 | Livestock landless systems: Temperate | | | | |
| F1 | Naturally regenerated forests: Tropics | | | | |
| F2 | Naturally regenerated forests: Subtropics | | | | |
| F3 | Naturally regenerated forests: Temperate | | | | |
| F5 | Planted forests: Tropics | | | | |
| F6 | Planted forests: Subtropics | | | | |
| A1 and A2 | Self-recruiting capture fisheries: Tropics and subtropics | NK | Marine fishing 539.966,5 (t) Continental fishing: 243.210,0 (t) | NK | 2007 |
| A5 and A6 | Culture-based fisheries: Tropics and substropics | NK | NK | NK | NK |
| A9 an A10 | Fed aquaculture: Tropics and subtropics | NK | Marine fishing: 78.405,0 (t) Continental fishing 210.644,5 (t) | NK | 2007 |
| A13 ans A14 | Non-fed aquaculture: Tropics and subtropics | NK | NK | NK | NK |
| C1 | Irrigated crops (rice): Tropics | 1,5 million | 9,6 million tons | NK | 2016 |
| C2 | Irrigated crops (rice): | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | Subtropics | (ha) | | | |
| C5 | Irrigated crops (other): Tropics | | | | |
| C6 | Irrigated crops (other): Subtropics | | | | |
| C9 | Rainfed crops: Tropics | 0,8 million (ha) | 1,7 million tons | NK | 2016 |
| C10 | Rainfed crops: Subtropics | | | | |
| M1 | Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics | | | | |
| M2 | Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics | | | | |
| O1 | Mixed forests | | | | |
| O2 | Organic systems | 0,75 million (ha) | NK | NK | 2017 |
| O3 | Extractive systems | 234 thousand farmers | $ 405 million | NK | 2017 |

**8. Comment on the effects on biodiversity for food and agriculture of production destined for exportation versus production for local and/or national consumption. Where information is available, indicate for each production system the proportion of production that is destined for export, the major commodities involved, the impact on the methods of production (e.g. adoption of specific production practices to meet export needs) and the implications for biodiversity.**

- According to data from the Brazilian Institute of Geography and Statistics (IBGE), Brazil presents a great diversity of agricultural crops, divided between permanent and temporary crops, forest and non-timber forest products. The main agricultural products of permanent crops and their respective productions (1,000t) in 2015 were: Avocado (180), apple (1.264), banana (6.844), black pepper (51), cashew nut (102), cocoa (273), coconut (1.958), coffee (2.646), erva mate (602), fig (29), grape (1.497), guava (424), guarana (36), heart-of-palm (109) india tea (0,27), khaki (192), latex rubber (319), lemon (1.180), mandarine (999), mango (1.264), nut (5,2), olive (0,52), orange (16.746), palm oil (1.585), papaya (1.463), passio fruit (694), pear (21), peach (216), quince (0,84), tongue (0,6) and urucum (14). In temporary crops the main products (1,000t) grown in 2015 harvest were: barley (186), bean (3.090), broad bean (4), castor bean (46), cassava (23.059), corn (85.284), cotton (4.066), flaxseed (12), garlic (117), jute (0,9), malva (4,9), melon (521), oatmeal (504), onion (1.445), pea (2,5), peanut (500), pineapple (1.801), potato (3.867), rami fiber (0,2), rice (12.301), rye (4,9), sorgho (2.136)), soybean (97.464), sugar cane (748.636), sunflower (155), sweet potato (595), tobacco leaf (867), tomato (4.187), triticale (39), watermelon (2.119) and wheat (5.508).

- Forest production is concentrated in *Eucalyptus* spp., *Pinnus* spp. and acacia-negra (*Acacia mearnsii*) for exploitation, mainly, of cellulose, wood, firewood, coal, resins and other coproducts.

- Among the several products listed above, according to data from the Federation of Industry of the State São Paulo (FIESP), the main products exported by Brazilian agribusiness in August 2017 were (1,000t): soybean (2.776), sugar (1.048), ethanol (90), corn (818), meat (1.442), cellulose (569), paper (162), coffee (439), wood and derivates (283), leather and derivates (204), cotton (110), orange juice (180), cocoa and derivates (32) and dairy products (7).

- Animal production involves cattle breeding (dairy cattle and beef cattle), as well as pigs and poultry (slaughter and egg production) and, to a lesser extent, sheep and goats. It is also important to report the existence of commercial breeding of some native animals species, case of the alligator (*Caiman* spp.) and freshwater chelonians (*Podocnemis* spp.), according to regulation given by Normative Instruction Ibama No. 07/2015, of Apr. 30.2015 and other legal instruments. It is also important to emphasize that the continental fishery production, represented by aquaculture production with native fish species, has gradually increased, representing 45.8% of the total continental fishery production in 2011, with 249,310 tons, according to data from the 5th National Report for the Convention on Biological Diversity (2016).

- Regarding extractive production, according to the Bulletin of Socio-biodiversity of 2017, this activity involves approximately 234 thousand families of small farmers. In 2015, the value of vegetable extractive production in Brazil was approximately US $ 405 million and products that stood out were açaí ($ 130 million), native herb-mate ($ 107 million), babassu almonds ($ 29 million), Brazil nut ($ 29 million), piaçava fibers ($ 28 million) and carnauba powder ($ 53 million). The concept of Socio-biodiversity unites people to the environment, representing an integrated system composed of several actors and a succession of management processes, production, processing distribution, marketing and consumption of products and services with cultural identity and incorporation of local values and knowledge, seeking the fair and equitable distribution of their benefits. Currently, the socio-biodiversity production chains still present limitations such as informality, creation and management of associations and cooperatives, low scale and pulverization of production, high perishability, little applied technology, complex outflow logistics, variable and disorganized market, as well as low prices paid to producers.

- Considering the great Brazilian agricultural potential, it is fundamental the permanent search for the balance between production and environmental and biodiversity conservation. Studies have demonstrated the importance of the conservation of native species of pollinators to produce tomato, cotton and native and non-native fruits. In addition, other studies have demonstrated the importance of soil biodiversity for sustaining fertility and productivity, as well as the positive influence on soil biodiversity exerted by environmentally friendly production practices and the presence of native vegetation maintained on the farm. Recent changes in climate patterns, combined with disorderly urban growth, are also increasing the importance of ecosystem-based adaptation measures such as maintaining vegetation cover and ecological balance to reduce the effects of droughts and floods, which are also beginning to be felt more forcefully in the energy (hydroelectric) and water supply sectors.

- It is also important to mention other activities that generate employment and income and are highly dependent on biodiversity conservation, such as ecotourism in Brazil. This is an immense potential still little explored in the Country, considering the extensive and inviting national coastline with the diverse types of forests, savannahs, fields, and wetlands. Despite the enormous contribution of biodiversity and the balance of ecosystems to the socio-economic development of the country and to human well-being, awareness of this dependence is not yet sufficiently impregnated in the specific culture of the various economic sectors to raise the importance of conservation to the level required in sector programs and policies.

## CHAPTER 2: Drivers of change

***Proposed structure of the chapter and information to be included in the Country Reports***

This Chapter provides an assessment of the major drivers causing changes (drivers list and descriptions provided in Annex 3), either positive or negative, on the state of biodiversity for food and agriculture in the country, with specific attention to changes in the associated biodiversity in and around production systems, ecosystem services and wild foods. This Chapter also encourages countries to compare drivers between different production systems.

The Chapter will address the following topics related to drivers of change in biodiversity for food and agriculture:

- The effects of drivers and stressors over the past ten years on a) associated biodiversity, b) ecosystem services and c) wild foods;
- Impacts of drivers on the involvement of women in the maintenance and use of biodiversity for food and agriculture, the application and preservation of traditional knowledge, and rural poverty alleviation;
- Countermeasures addressing current and emerging drivers, best practices and lessons learned.

The Country Report should include information or reference to any specific studies that have been carried out in the last ten or so years that relate observed changes in the extent or distribution of associated biodiversity and wild foods in the country to different drivers.

*IMPORTANT: Throughout these guidelines, questions on production systems will refer to the production systems identified in Chapter 1, Table 1 as present in your country. When referring to them in your answers, please provide the production system code and/or full name as found in Table 1.*

*One of the main objectives of this report is to identify knowledge gaps and to provide baseline information for future assessments. Thus please indicate where information is unavailable.*

*Effects of drivers of change on associated biodiversity*

**9. What have been the most important drivers[12] affecting the extent and distribution of associated biodiversity[13] in the last 10 years in your country? In describing the drivers you may wish to indicate the production systems where associated biodiversity is most affected and identify drivers that are common to the various components of associated biodiversity listed. Indicate where possible the indicators used to measure changes, along with the sources of information.**

- Disorganized expansion of agriculture: Brazil is one of the world´s leading food producers, having achieved a 70% increase in agricultural production between 2000 and 2012. According to data from IBGE in 2012, productive rural properties occupied a total of 333.7 million hectares, predominantly covered by pastures (48.0%), in addition to natural forests (26.1%), agriculture (16.9%), agroforestry systems and planted forests (3.9%) and others (5.1%);

- Loss, fragmentation and simplification or modification of natural habitats as a consequence of changes in land use, the threat of environmental contamination due to inappropriate use of agrochemicals;

- Exotic and invasive species, both in the terrestrial and in the aquatic environment;

- Deforestation and opening of new agricultural áreas in all biomes, with emphasis on the Cerrado, which was the most threatened biome by the expansion of crops and livestock;

- Climate change and emission of air pollutants;

- Threats to aquatic and coastal habitats, with emphasis on Brazilian mangroves, which are fragile environments that are being impacted by fragmentation and loss of vegetation cover, as well as pollution, which leads to a decline in the availability of natural resources, of which many traditional communities and economic sectors depend directly for their survival;

- Water pollution, which affects both aquatic and terrestrial biodiversity: domestic sewage is still an important source of water pollution, particularly in urban areas. In addition to agriculture flow, this sewage is also an important contribution to the load of organic matter in Brazilian hydrous bodies.

**10. Where associated biodiversity is believed to be affected by climate change, please provide additional information on the nature, severity and frequency of the climate threat and the production systems impacted.**

- Several estudies state there is no doubt that we are facing a global biodiversity crisis, catalyzed by human influence, which is far reaching and unprecedented, being able to take half the species to extinct by the end of this century. However, it is not only the extinction rates that are increasing, but the geographic scope of threatened species is also

[12] Description of drivers can be found in Annex 3.

[13] Description of associated biodiversity can be found in Annex 1.

being expanded. In the last 100 years, there have been significant changes in climate and climatic extremes, with an impact on the geographical distribution of plants and animals. Changes in weather patterns with an increase in minimum daily temperature and decrease in days with frost and cold waves influence the life cycle of many agricultural pests, which may increase the use of pesticides. Such changes have profound implications for natural and agricultural systems, diminishing species aptitude, with different levels and effects on individuals, populations and communities.

- Some Brazilian reseachers report that environmental changes have coused significant losses on biodiversity, directly affecting the avaiability of ecosystem services. According to these authors, the Millenium Ecossystem Assessment (AEM), considered the most extensive evaluation ever made on the state and health of the planets ecosystems, with the participation of 1,360 researchers from 95 contries, showed that in the last 50 years, the athropic action has altered the structure of ecosystems more rapidly and extensively than at any other equivalent time interval in the history of mankind. This has led to a substantial loss of biodiversity on the planet. Reggarding biogeochemical cycles, nitrogen and phosphorus fluxes have doubled and tripled, respectively, in terrestrial ecosystems since 1960. About 50% of all synthetic nitrogen has been used since 1985, and about 60% of the increase in CO2, evaluated since 1750, has accured since 1959. In addition, this evaluation concluded that 60% of the evaluated ecosystem services are degraded or are being used in an unsustainable way, causing damage to human well- being and losses in the natural wealth of all nations.

- As global climate change accelerates, one of the most urgent tasks for the coming decades is to develop accurate predictions about biological responses to guide the effective protection of biodiversity. Predictive models in biology provide a means for scientists to project changes to species and ecosystems in response to disturbances such as climate change. Most current predictive models, however, exclude important biological mechanisms such as demography, dispersal, evolution, and species interactions. These biological mechanisms have been shown to be important in mediating past and present responses to climate change. Thus, current modeling efforts do not provide sufficiently accurate predictions. Despite the many complexities involved, biologists are rapidly developing tools that include the key biological processes needed to improve predictive accuracy. The biggest obstacle to applying these more realistic models is that the data needed to inform them are almost always missing. We suggest ways to fill this growing gap between model sophistication and information to predict and prevent the most damaging aspects of climate change for life on Earth.

- Far beyond the direct loss of biodiversity, climate change also affects rural communities in the poorest regions of Brazil, notably in the northeast. In Brazil, the Panel on Climate Change projects that by the end of this century there may be a 40% to 50% decrease in the distribution of rainfall in the biome Caatinga, which should significantly aggravate the water availability of this place. If this scenario is confirmed, the availability of water in the semi-arid region should be even more critical, since current demand id already higher than its water sources in 1,133 of its municipalities, which shelter 20million people, 44% of whom live in rural areas.

***Effects of drivers of change on biodiversity for food and agriculture***

This section applies to all biodiversity for food and agriculture. Countries that previously presented or are currently preparing a Country Report on Forest, Aquatic, Animal or Plant Genetic Resources, may wish to use these reports as reference.

**11. For each production system present in your country as indicated in Table 1, fill in the code and name of each production system in**

**Table 4 (repeat Table for each production system). For each production system indicate which drivers have been influencing biodiversity for food and agriculture, disaggregated by sector, during the past 10 years (description of drivers can be found in Annex 3). Drivers may have a strongly positive (2), positive (1), negative (-1), and strongly negative effect (-2), or no effect at all (0) on biodiversity for food and agriculture. If the effect of the driver is unknown or not applicable, please indicate not known (NK) or not applicable (NA).**

**Table 4.** Effect of drivers on sector biodiversity within production systems in the country, by animal (AnGR), plant (PGR), aquatic (AqGR) and forest (FGR) genetic resources.

| **Production systems** | **Drivers**[14] | **Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA) | | | |
|---|---|---|---|---|---|
| Code or name | | PGR | FGR | AnGR | AqGR |
| Livestock | Changes in land and water use and management | -2 | -2 | NK | NK |
| | Pollution and external inputs | -1 | -1 | NK | NK |
| | Over-exploitation and overharvesting | -2 | -2 | NK | NK |
| | Climate change | -2 | -1 | NK | NK |
| | Natural disasters | -1 | -1 | NK | NK |
| | Pests, diseases, alien invasive species | -2 | -1 | NK | NK |
| | Markets, trade and the private sector | -2 | -2 | NK | NK |
| | Policies | -2 | -2 | NK | NK |
| | Population growth and urbanization | -1 | -1 | NK | NK |
| | Changing economic, socio-political, and cultural factors | -2 | -2 | NK | NK |
| | Advancements and innovations in science and technology | 1 | 1 | NK | NK |
| Forests | Changes in land and water use and management | -2 | -2 | NK | NK |
| | Pollution and external inputs | -1 | -1 | NK | NK |
| | Over-exploitation and overharvesting | -2 | -2 | NK | NK |
| | Climate change | -2 | -1 | NK | NK |
| | Natural disasters | -1 | -1 | NK | NK |
| | Pests, diseases, alien invasive species | -2 | -1 | NK | NK |
| | Markets, trade and the private sector | -2 | -2 | NK | NK |
| | Policies | -2 | -2 | NK | NK |
| | Population growth and urbanization | -1 | -1 | NK | NK |
| | Changing economic, socio-political, and cultural factors | -2 | -2 | NK | NK |
| | Advancements and innovations in science and technology | 1 | 1 | NK | NK |
| ult ur e an d Fi | Changes in land and water use and management | -2 | -2 | NK | NK |

[14] Description of drivers can be found in Annex 3.

| | | | | | |
|---|---|---|---|---|---|
| | Pollution and external inputs | -1 | -1 | NK | NK |
| | Over-exploitation and overharvesting | -2 | -2 | NK | NK |
| | Climate change | -2 | -1 | NK | NK |
| | Natural disasters | -1 | -1 | NK | NK |
| | Pests, diseases, alien invasive species | -2 | -1 | NK | NK |
| | Markets, trade and the private sector | -2 | -2 | NK | NK |
| | Policies | -2 | -2 | NK | NK |
| | Population growth and urbanization | -1 | -1 | NK | NK |
| | Changing economic, socio-political, and cultural factors | -2 | -2 | NK | NK |
| | Advancements and innovations in science and technology | 1 | 1 | NK | NK |
| Crops | Changes in land and water use and management | -2 | -2 | NK | NK |
| | Pollution and external inputs | -1 | -1 | NK | NK |
| | Over-exploitation and overharvesting | -2 | -2 | NK | NK |
| | Climate change | -2 | -1 | NK | NK |
| | Natural disasters | -1 | -1 | NK | NK |
| | Pests, diseases, alien invasive species | -2 | -1 | NK | NK |
| | Markets, trade and the private sector | -2 | -2 | NK | NK |
| | Policies | -2 | -2 | NK | NK |
| | Population growth and urbanization | -1 | -1 | NK | NK |
| | Changing economic, socio-political, and cultural factors | -2 | -2 | NK | NK |
| | Advancements and innovations in science and technology | 1 | 1 | NK | NK |
| Mixed | Changes in land and water use and management | -2 | -2 | NK | NK |
| | Pollution and external inputs | -1 | -1 | NK | NK |
| | Over-exploitation and overharvesting | -2 | -2 | NK | NK |
| | Climate change | -2 | -1 | NK | NK |
| | Natural disasters | -1 | -1 | NK | NK |
| | Pests, diseases, alien invasive species | -2 | -1 | NK | NK |
| | Markets, trade and the private sector | -2 | -2 | NK | NK |
| | Policies | -2 | -2 | NK | NK |
| | Population growth and urbanization | -1 | -1 | NK | NK |
| | Changing economic, socio-political, and cultural factors | -2 | -2 | NK | NK |
| | Advancements and innovations in science and technology | 1 | 1 | NK | NK |
| Mixed forests | Changes in land and water use and management | -2 | -2 | NK | NK |
| | Pollution and external inputs | -1 | -1 | NK | NK |
| | Over-exploitation and overharvesting | -2 | -2 | NK | NK |
| | Climate change | -2 | -1 | NK | NK |
| | Natural disasters | -1 | -1 | NK | NK |
| | Pests, diseases, alien invasive species | -2 | -1 | NK | NK |
| | Markets, trade and the private sector | -2 | -2 | NK | NK |
| | Policies | -2 | -2 | NK | NK |
| | Population growth and urbanization | -1 | -1 | NK | NK |
| | Changing economic, socio-political, and cultural factors | -2 | -2 | NK | NK |
| | Advancements and innovations in science and technology | 1 | 1 | NK | NK |

| | | | | | |
|---|---|---|---|---|---|
| Organic systems | Changes in land and water use and management | -2 | -2 | NK | NK |
| | Pollution and external inputs | -1 | -1 | NK | NK |
| | Over-exploitation and overharvesting | -2 | -2 | NK | NK |
| | Climate change | -2 | -1 | NK | NK |
| | Natural disasters | -1 | -1 | NK | NK |
| | Pests, diseases, alien invasive species | -2 | -1 | NK | NK |
| | Markets, trade and the private sector | -2 | -2 | NK | NK |
| | Policies | -2 | -2 | NK | NK |
| | Population growth and urbanization | -1 | -1 | NK | NK |
| | Changing economic, socio-political, and cultural factors | -2 | -2 | NK | NK |
| | Advancements and innovations in science and technology | 1 | 1 | NK | NK |
| Extractive systems | Changes in land and water use and management | -2 | -2 | NK | NK |
| | Pollution and external inputs | -1 | -1 | NK | NK |
| | Over-exploitation and overharvesting | -2 | -2 | NK | NK |
| | Climate change | -2 | -1 | NK | NK |
| | Natural disasters | -1 | -1 | NK | NK |
| | Pests, diseases, alien invasive species | -2 | -1 | NK | NK |
| | Markets, trade and the private sector | -2 | -2 | NK | NK |
| | Policies | -2 | -2 | NK | NK |
| | Population growth and urbanization | -1 | -1 | NK | NK |
| | Changing economic, socio-political, and cultural factors | -2 | -2 | NK | NK |
| | Advancements and innovations in science and technology | 1 | 1 | NK | NK |

***Effects of drivers of change on ecosystem services***

**12. What have been the main drivers (descriptions in Annex 3) affecting regulating and supporting ecosystem services (descriptions in Annex 4) in the country during the last 10 years? Describe, for each production system identified in Table 1, the major driver(s) affecting ecosystem services and indicate the effect on ecosystem services as being strongly positive (2), positive (1), negative (-), strongly negative (-2), no effect (0), not known (NK), or not applicable (NA) in Table 5 (repeat table for each production system).**

**Table 5.** Major drivers and their effect on ecosystem services in production systems.

| **Production systems** | **Drivers**[15] | **Effect of drivers on ecosystem services**[16] (2, 1, 0,-1, -2, NK, NA) |
|---|---|---|

[15] Description of drivers can be found in Annex 3.

[16] Description of ecosystem services can be found in Annex 4.

| Code or name | | Pollination | Pest and disease regulation | Water purification and waste treatment | Natural hazard regulation | Nutrient cycling | Soil formation and protection | Water cycling | Habitat provisioning | Production of oxygen/ Gas regulation |
|---|---|---|---|---|---|---|---|---|---|---|
| Livestock | Changes in land and water use and management | -2 | -2 | -2 | -1 | -2 | -2 | -2 | -2 | -2 |
| | Pollution and external inputs | -1 | -1 | -2 | -1 | -2 | -1 | -1 | -2 | -2 |
| | Over-exploitation and overharvesting | -1 | -1 | -2 | -1 | -2 | -1 | -2 | -2 | -2 |
| | Climate change | -1 | -1 | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| | Natural disasters | -1 | -1 | -2 | -1 | -2 | -2 | -2 | -1 | 1 |
| | Pests, diseases, alien invasive species | -1 | -2 | -1 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Markets, trade and the private sector | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -1 | -2 |
| | Policies | -1 | -1 | -1 | 1 | -1 | 1 | -1 | -1 | -2 |
| | Population growth and urbanization | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Changing economic, socio-political, and cultural factors | 0 | 0 | 1 | 1 | 0 | NA | 1 | NK | NK |
| | Advancements and innovations in science and technology | 0 | 0 | 1 | 1 | 0 | NA | 1 | 1 | NK |
| | Other | | | | | | | | | |
| Forests | Changes in land and water use and management | -2 | -2 | -2 | -1 | -2 | -2 | -2 | -2 | -2 |
| | Pollution and external inputs | -1 | -1 | -2 | -1 | -2 | -1 | -1 | -2 | -2 |
| | Over-exploitation and overharvesting | -1 | -1 | -2 | -1 | -2 | -1 | -2 | -2 | -2 |
| | Climate change | -1 | -1 | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| | Natural disasters | -1 | -1 | -2 | -1 | -2 | -2 | -2 | -1 | 1 |
| | Pests, diseases, alien invasive species | -1 | -2 | -1 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Markets, trade and the private sector | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -1 | -2 |
| | Policies | -1 | -1 | -1 | 1 | -1 | 1 | -1 | -1 | -2 |
| | Population growth and urbanization | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Changing economic, socio-political, and cultural factors | 0 | 0 | 1 | 1 | 0 | NA | 1 | NK | NK |
| | Advancements and innovations in science and technology | 0 | 0 | 1 | 1 | 0 | NA | 1 | 1 | NK |
| | Other | | | | | | | | | |
| Aquaculture and Fisheries | Changes in land and water use and management | -2 | -2 | -2 | -1 | -2 | -2 | -2 | -2 | -2 |
| | Pollution and external inputs | -1 | -1 | -2 | -1 | -2 | -1 | -1 | -2 | -2 |
| | Over-exploitation and overharvesting | -1 | -1 | -2 | -1 | -2 | -1 | -2 | -2 | -2 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Climate change | -1 | -1 | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| | Natural disasters | -1 | -1 | -2 | -1 | -2 | -2 | -2 | -1 | 1 |
| | Pests, diseases, alien invasive species | -1 | -2 | -1 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Markets, trade and the private sector | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -1 | -2 |
| | Policies | -1 | -1 | -1 | 1 | -1 | 1 | -1 | -1 | -2 |
| | Population growth and urbanization | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Changing economic, socio-political, and cultural factors | 0 | 0 | 1 | 1 | 0 | NA | 1 | NK | NK |
| | Advancements and innovations in science and technology | 0 | 0 | 1 | 1 | 0 | NA | 1 | 1 | NK |
| | Other | | | | | | | | | |
| Crops | Changes in land and water use and management | -2 | -2 | -2 | -1 | -2 | -2 | -2 | -2 | -2 |
| | Pollution and external inputs | -1 | -1 | -2 | -1 | -2 | -1 | -1 | -2 | -2 |
| | Over-exploitation and overharvesting | -1 | -1 | -2 | -1 | -2 | -1 | -2 | -2 | -2 |
| | Climate change | -1 | -1 | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| | Natural disasters | -1 | -1 | -2 | -1 | -2 | -2 | -2 | -1 | 1 |
| | Pests, diseases, alien invasive species | -1 | -2 | -1 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Markets, trade and the private sector | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -1 | -2 |
| | Policies | -1 | -1 | -1 | 1 | -1 | 1 | -1 | -1 | -2 |
| | Population growth and urbanization | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Changing economic, socio-political, and cultural factors | 0 | 0 | 1 | 1 | 0 | NA | 1 | NK | NK |
| | Advancements and innovations in science and technology | 0 | 0 | 1 | 1 | 0 | NA | 1 | 1 | NK |
| | Other | | | | | | | | | |
| Mixed | Changes in land and water use and management | -2 | -2 | -2 | -1 | -2 | -2 | -2 | -2 | -2 |
| | Pollution and external inputs | -1 | -1 | -2 | -1 | -2 | -1 | -1 | -2 | -2 |
| | Over-exploitation and overharvesting | -1 | -1 | -2 | -1 | -2 | -1 | -2 | -2 | -2 |
| | Climate change | -1 | -1 | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| | Natural disasters | -1 | -1 | -2 | -1 | -2 | -2 | -2 | -1 | 1 |
| | Pests, diseases, alien invasive species | -1 | -2 | -1 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Markets, trade and the private sector | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -1 | -2 |
| | Policies | -1 | -1 | -1 | 1 | -1 | 1 | -1 | -1 | -2 |
| | Population growth and urbanization | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Changing economic, socio-political, and cultural factors | 0 | 0 | 1 | 1 | 0 | NA | 1 | NK | NK |
| | Advancements and innovations in science and technology | 0 | 0 | 1 | 1 | 0 | NA | 1 | 1 | NK |
| | Other | | | | | | | | | |
| Mixed forest | Changes in land and water use and management | -2 | -2 | -2 | -1 | -2 | -2 | -2 | -2 | -2 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pollution and external inputs | -1 | -1 | -2 | -1 | -2 | -1 | -1 | -2 | -2 |
| | Over-exploitation and overharvesting | -1 | -1 | -2 | -1 | -2 | -1 | -2 | -2 | -2 |
| | Climate change | -1 | -1 | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| | Natural disasters | -1 | -1 | -2 | -1 | -2 | -2 | -2 | -1 | 1 |
| | Pests, diseases, alien invasive species | -1 | -2 | -1 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Markets, trade and the private sector | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -1 | -2 |
| | Policies | -1 | -1 | -1 | 1 | -1 | 1 | -1 | -1 | -2 |
| | Population growth and urbanization | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Changing economic, socio-political, and cultural factors | 0 | 0 | 1 | 1 | 0 | NA | 1 | NK | NK |
| | Advancements and innovations in science and technology | 0 | 0 | 1 | 1 | 0 | NA | 1 | 1 | NK |
| | Other | | | | | | | | | |
| Extractive systems | Changes in land and water use and management | -2 | -2 | -2 | -1 | -2 | -2 | -2 | -2 | -2 |
| | Pollution and external inputs | -1 | -1 | -2 | -1 | -2 | -1 | -1 | -2 | -2 |
| | Over-exploitation and overharvesting | -1 | -1 | -2 | -1 | -2 | -1 | -2 | -2 | -2 |
| | Climate change | -1 | -1 | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| | Natural disasters | -1 | -1 | -2 | -1 | -2 | -2 | -2 | -1 | 1 |
| | Pests, diseases, alien invasive species | -1 | -2 | -1 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Markets, trade and the private sector | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -1 | -2 |
| | Policies | -1 | -1 | -1 | 1 | -1 | 1 | -1 | -1 | -2 |
| | Population growth and urbanization | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Changing economic, socio-political, and cultural factors | 0 | 0 | 1 | 1 | 0 | NA | 1 | NK | NK |
| | Advancements and innovations in science and technology | 0 | 0 | 1 | 1 | 0 | NA | 1 | 1 | NK |
| | Other | | | | | | | | | |
| Organics systems | Changes in land and water use and management | -2 | -2 | -2 | -1 | -2 | -2 | -2 | -2 | -2 |
| | Pollution and external inputs | -1 | -1 | -2 | -1 | -2 | -1 | -1 | -2 | -2 |
| | Over-exploitation and overharvesting | -1 | -1 | -2 | -1 | -2 | -1 | -2 | -2 | -2 |
| | Climate change | -1 | -1 | -2 | -2 | -1 | -2 | -2 | -2 | -2 |
| | Natural disasters | -1 | -1 | -2 | -1 | -2 | -2 | -2 | -1 | 1 |
| | Pests, diseases, alien invasive species | -1 | -2 | -1 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Markets, trade and the private sector | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -1 | -2 |
| | Policies | -1 | -1 | -1 | 1 | -1 | 1 | -1 | -1 | -2 |
| | Population growth and urbanization | -1 | -1 | -2 | 1 | -1 | 1 | 1 | -2 | -1 |
| | Changing economic, socio-political, and cultural factors | 0 | 0 | 1 | 1 | 0 | NA | 1 | NK | NK |
| | Advancements and innovations in science and technology | 0 | 0 | 1 | 1 | 0 | NA | 1 | 1 | NK |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Other | | | | | | | | | |

**13. Briefly describe the main driver(s) affecting ecosystem services in each production system, as identified in Table 5. Include where possible a description of the components of associated biodiversity that are affected, the indicators used to measure change, and the source of information.**

- The most important driver affecting ecosystem services is the changes in land and water use and management. The fast and intense changes undergone by terrestrial and aquatic ecosystems in the Amazon, Cerrado and Caatinga biomes are results mainly of land use change for the implementation of monocultures aimed to grain production, silviculture and beef production.

- Planted forests (Eucalyptus forests in the North of Minas Gerais State): has promoted changes in land and water use and management. Soil exposure in eucalyptus plantation contributes to riverbed siltation and evapotranspiration higher than precipitation (in semi-arid regions) contributes to the deficit of water availability in the ecosystems and lack of water for small agriculture systems and drinking water for people from small communities and municipalities.

- Irrigated crops (mainly coffee in the North of Minas Gerais State): Changes in land and water use and management. Evapotranspiration higher than precipitation (in semi-arid regions) contributes to the deficit of water availability in the ecosystems and lack of water for small agriculture systems and drinking water for people from small communities and municipalities.

***Effects of drivers of change on wild foods***

**14. What were the main drivers affecting the availability, knowledge and diversity of wild foods during the last ten years in the country? In Table 6, indicate the major drivers affecting availability, knowledge and diversity of wild foods, and if the effects are strongly positive (2), positive (1), negative (-1), strongly negative (-2), no effect (0), not known (NK), or not applicable (NA).**

**Table 6.** Drivers affecting availability, knowledge and diversity of wild foods.

| | **Effect of drivers (2, 1, 0,-1, -2, NK, NA)** | | |
|---|---|---|---|
| **Drivers**[17] | Availability of wild foods | Knowledge of wild foods | Diversity of wild food |
| Changes in land and water use and management | -2 | -1 | -1 |
| Pollution and external inputs | -1 | NA | -1 |
| Over-exploitation and overharvesting | -2 | NA | -1 |
| Climate change | -1 | NA | -1 |
| Natural disasters | -1 | NA | -1 |
| Pests, diseases, alien invasive species | -1 | NA | -1 |
| Changing markets | -2 | -1 | -1 |

[17] Description of drivers can be found in Annex 3.

| | | | |
|---|---|---|---|
| Policies | -1 | -1 | NA |
| Population growth and urbanization | -1 | -1 | -1 |
| Changing economic, socio-political, and cultural factors | -1 | -2 | -1 |
| Advancements and innovations in science and technology | 1 | 1 | NA |
| Other [*please specify*] | | | |

**15. Briefly describe the main drivers affecting the availability, diversity and knowledge of wild foods in your country, as identified in Table 6. Include where possible indicators used to measure change, along with the source of information.**

- Disorganized Expansion of Agriculture: Brazil is one of the main food producers in the world, having obtained a 70% increase in agricultural production between 2000 and 2012. According to data from IBGE for 2012, productive rural proprieties occupied a total of 333.7 million hectares, predominantly covered by pastures (48.0%) and natural forests (26.1%). Temporary agriculture and permanent agriculture occupied 16.9% of these properties, while combined agroforestry and planted forests accounted for only 3.9%. This disorderly advance in agricultural activities has resulted in a 4.3% reduction in the original area of the Pampa biome in the last 15 years, according to data from the Secretariat of the Environment and Sustainable Development of Rio Grande do Sul. Still according to data from the non-governmental organization Observatório do Clima (http://www.observatóriodoclima.eco.br/pantanal-perde-13-das-matas-em-15-anos/), in the last 15 years the Pantanal had a reduction of 13% in its original coverage, dedicated to the conversion of natural vegetation to pastures planted with vegetation.

- Planted forests (*Eucalyptus* forests in the North of Minas Gerais State): after 30 years of changes in land cover, eucalyptus plantation has promoted changes in land and water use and management resulting in deficit of water availability in the ecosystems. Changes in wild species phenology and productivity are reported by traditional population that made used of wild species (for instance: pequi, cagaita, and mangaba).

- Invasive Exotic Species: represent the second largest global cause of biodiversity loss, with significant negative impacts on the environments where they are established, on human and animal health, and also on production systems. Globalization and the development of transport technologies have given man the ability to move and disseminate animal, plant and micro-organism species more rapidly and intensively. Due to the great threat posed by invasive exotic species, the theme has become a priority in the different spheres of Brazilian government, with the development of new public policies. To do so, the country seeks to develop strategies, such as aquaculture projects, aimed at productive and social inclusion and the promotion of food and nutritional security of the Brazilian population.

- Deforestation: currently one of the biggest causes of habitats loss in Brazil. According to data from the National Institute of Space Research (INPE), the estimated deforestation

rate in Amazon alone was 7,989 km² of clear cut from August 2015 to july2016. This means an increase of 29% to the year of 2015, in which were measured 6,207 km2. However, the current rate represents a reduction of 71% compared to 2004, when the Federal Government initiated the Plan for Prevention an Control of Deforestation in Amazon (PPCDAm), currently coordinated by the Ministry of the Environment.

- Fire: Despite the downward trend, the number of occurrences of heat sources in the Amazon and Cerrado is still higher than in any other biome. In 2015, more tan 50 thousand outbreaks of fire were recorded in both biomes, however, well blow what was recorded in 2010, where the figures exceed 120 cases. These variations are directly influenced by climate variation, soil cover, economic aspects, and subsidies and public policies in fire prevention and fire fighting.

- Climate change: Although it is still a serious problem and some sectors evaluated (energy, industry, waste and agriculture) present an increase in absolute GHG emission compared to 1990, GHG emissions in Brazil remained below projected levels.

- Threats to aquatic and coastal habitats: About 80% of Brazilian coast contains mangroves, covering a total of 1,382,815 ha. Those are fragile environments that are being impacted by fragmentation and loss of vegetation cover, construction of dams, and deterioration of the aquatic habitat quality, mainly due to pollution and changes in hydrodynamics, which leads to a decline in the availability of natural resources, which numerous traditional communities and economic sectors depend directly for their survival.

- Pollution: Treated and untreated domestic sewage is still an important source of water pollution, particularly in urban areas, together with the flow from agriculture, this sewage is also an important contribution to the load of organic matter in Brazilian water bodies. In 2010, 15.2% of Brazilian river presented some type of critical condition: 10.9% faces critical conditions in relation to water quantity, 1.5% in relation to water quality, and 2.8% faced conditions critical to both quantity and quality of water.

- Changes in land and water use and management is the most important driver affecting the availability, diversity and knowledge of wild foods. The fast land use change caused by deforestation aimed to convert land for agriculture, cattle ranching and silviculture reduces the areas with wild foods at such point that in some parts of the country wild fruits are found only the preserved areas. This is the case of the widely appreciated seeds of Araucaria angustifolia, a tree once widely found in the southern and eastern Brazil, now present mainly in the few preserved areas. All over the country the loss of forests and savannahs is drastically reducing opportunities for wild food collecting. Land use changes also affect the water as watersheds as the safeguards of land use close to waterbodies defined in environmental legislation is not followed. Additionally, use of pesticides in agriculture and pastureland contaminate water bodies.

***Effects of drivers of change on traditional knowledge, gender and rural livelihoods***

In answering questions 0 to 0, describe the major drivers that have had an impact in the last 10 years and include where possible indicators used to measure change, and sources of information.

**16. Which drivers have had the most significant effect on the involvement of women in the maintenance and use of biodiversity for food and agriculture?**

The participation of women in agricultural activities has increased significantly in the last 10 years in Brazil, mainly due to the creation of public policies for the empowerment of rural women. The Brazilian government, through the Ministry of Agrarian Development (MDA) recognizes the important contribution of women to the production of healthy food, security and sovereignty of food and sustainable and solidary rural development of the country. Women keep much of the traditional knowledge of the interior of Brazil, the use and conservation of native species in food, medicine, handicrafts and several other areas. Among the main public policies for women farmers, stand out the following:

- National Documentation Program for Women Rural Workers (PNDTR): ensures access to basic, social security and labor documentation.

- Territorial management and participation: action to strengthen women's participation in territories and in rural development agenda, seeking to broaden access to public policies for social and economic inclusion.

- Agrarian Reform with equal access to land and compulsory joint titling: guaranteeing the right of woman to be beneficiaries of agrarian reform on equal terms with men.

- Productive Inclusion in Agrarian Reform: through a program called Fomento Mulher, which is a modality of Credit Installation, women expand their insertion and participation in the productive and economic dynamics in the field.

- National Land Credit Program (PNCF): in this program joint titling guarantees women right for rural property titles. In the program, joint bookkeeping was also guaranteed when both man borrowers and women borrowers constitute a married couple or a stable union.

- Program for the Productive Organization of Rural Women (POPMR): aims to strengthen the productive organizations of the women rural workers, encouraging the exchange of information, of technical, cultural, organizational, management and commercialization knowledge.

- Technical assistance and Rural Extension (ATER): offers services and technical assistance aimed at guiding agricultural and non-agricultural production directly in rural communities and agrarian reform settlements. Since 2004, the National Policy for

Technical Assistance and Rural Extension (PNATER) has a sectorial policy on technical Assistance and Rural Extension (ATER) specific to women.

- Pronaf women: is a specific credit line of the National Program for the Strengthening of Family Agriculture, which aims to recognize and stimulate the work of rural women in Family agriculture and agrarian reform settlements.

- Food Acquisition Program (PAA): was created in 2003 to strengthen and guarantee the marketing of products from family agriculture, establishing differentiated rules for their participation in public purchases. In this program, women have priority in the selection and implementation of proposals ensuring that at least 70% participation of women in its composition.

- National Plan for Agroecology and Organic Production (Planapo): recognize and values the role of women in organic and agro-ecological production through 18 initiatives unique to women.

- Encouraging studies and research: the Ministry of Agrarian Development has stimulated the production and dissemination of research and studies aimed at reflecting on the promotion of egalitarian rights between men and women in rural areas.

- Support and international coordination: guaranteeing the participation of women farmers in Brazil in events such as the Specialized Meeting on Family Agriculture of Mercosur (REAF), the Community of Portuguese Speaking Countries (CPLP) and the Community of Latin American States and Caribbean. The objective is to overcome regional differences and reaffirm common guidelines and directives on advocacy equality between men and women in family agriculture in South America.

**17. Which drivers have had the most significant effect on the maintenance and use of traditional knowledge relating to biodiversity for food and agriculture? (Fonte: Rel. Biodiv. MMA).**

- National Plan for Promotion of Socio-Biodiversity Productive Chains, created in 2009, with the objective of promoting the sustainable use of biodiversity by traditional peoples and communities, which allowed the identification of 30 plant species traditionally used or with economic potential, as well as training 12 local organizations of traditional peoples and communities (cooperatives and associations). The plan also aims to strengthen Local Productive Arrangements (APL) focusing on priority production chains, facilitating access to markets and establishing fairer relation with other economic agents.

- National Policy on Minimum Price Guarantee for Socio-Biodiversity Products and the National Food Acquisition Program (PAA): these programs facilitate the marketing of food produce by small farmer from traditional communities, quilombolas and indigenous peoples who sell açaí, nuts, babassu and rubber. This subsidy increases production and contributes to the formalization of trade in these products, with the creation of price lists and structured production chains, with greater financial returns to small producers.

- The National Policy for Sustainable Development of Traditional Peoples and Communities (PNPCT): promulgated in 2007, aims to promote the sustainable development of these communities, with emphasis on the recognition, strengthen and guarantee of their territorial, social, environmental, economic and cultural rights, respecting their identities, organizational patterns and institutions. It is also important to mention the Plan for the Sustainable Development of Traditional African Peoples and Communities, with the main objective of safeguarding the African traditions preserved in Brazil. The plan includes a set of public policies to secure rights, protect cultural heritage and combat extreme poverty through the implementation of emergency actions and the promotion of economic and productive inclusion.

- Plan for the Strengthening of Extractivism, still under preparation: aims to complement a series of policies that have been adopted by the Ministry of Environment in recent years to provide infrastructure to the extractive communities and enable them to develop through activities based on the economy of the forest.

- Knowledge and cultural diversity meetings: aiming to create means of protection, valorization and promotion of traditional knowledge. The Ministry of Culture, through the Secretariat for Citizenship and Cultural Diversity (SCDC), has been carrying out various initiatives to promote and disseminate traditional knowledge and practices. The "Meeting of Knowledge and Cultural Diversity" project has a partnership with public universities and aims to involve instructors from traditional communities in the discussion of themes such as reforestation, nature, culture, medicinal plants, dance, mythology and music.

- Meeting of traditional peoples and communities: the Ministry of Culture supports several regional events that promote the encounter between traditional peoples and communities to exchange knowledge and experiences. An example is the Meeting of Traditional Cultures of the Chapada dos Veadeiros, in Goiás. In June 2017, the XVII annual event was held, consisting of debates and conferences to train, promote, value and protect the ways of life of Brazilian traditional populations, as well as a fair for the exchange of seeds and products of biodiversity. The meeting also includes workshops on national policies for traditional knowledge associated with biodiversity, rights and benefit sharing.

- Environmental management of indigenous lands: the National Policy for the Territorial and Environmental Management of Indigenous Lands, implemented in 2012, has the following objectives: (i) protection of indigenous territories and natural resources; (ii) indigenous governance and participation; (iii) conservation units and indigenous lands; (iv) prevention and recovery of environmental damage; (v) sustainable use of natural resources and indigenous production initiatives; (vi) intellectual property and genetic heritage; and (vii) capacitation, training, information exchange and environmental education.

- Measures and policies for access and sharing of benefits: stimulates the development of Community Protocols that prepare the community to become directly involved in contracts for access to traditional knowledge and biodiversity, in addition to the prior establishment of conditions and terms that are acceptable to the community. This also facilitates access procedures for interested businesses, reducing initial costs and streamlining the process of obtaining valid contracts.

- Planted forests (Eucalyptus forests in the North of Minas Gerais State). Once traditional population have had their traditional territory occupied by planted forests, people are self-organizing to counter (fight back) territory, biodiversity and traditional knowledge losses.

For a few decades now, in Brazil, the discussion and actions that have impacted on the maintenance and use of traditional knowledge related to biodiversity for food and agriculture have increased in Brazil. The main factors nowadays that have greater effect in the maintenance and use of the traditional knowledge for the biodiversity for food and agriculture are: Policies; Population growth and urbanization; Changing economic, socio-political, and cultural factors.

Legislation, especially since the early 2000s, has ensured greater protection for traditional populations, both by increasing their territorial area, crating protect areas, and by recognizing different cultural and traditional groups. This tends to have a positive impact on the preservation of the general environments and species present there, as well as on the preservation of the species that these populations use for food and agriculture.

However, these same laws have also had a major negative impact on the culture of traditional populations. The new laws, which have the function of preserving and valorize traditional knowledge and culture, have forced these traditional populations to learn and obey many rules that were not part of the culture of most traditional populations, especially indigenous peoples. For example, projects, authorizations and actions to be carried out with traditional populations have to be formalized through the signing of agreements, which must be signed by legal representatives (associations, unions, cooperatives, for example) and not simply by traditional leader of the community. Functions/positions were created that did not exist in the culture of most traditional communities. And in many of these traditional communities, young people, because they have greater ease with Portuguese and resources such as information technology, have come to have a greater force in the dialogue with the different actors in negotiations of community interest, often greater than the traditional leadership itself from within the community. The role / power of the elders today are less than it was in the past.

But the greatest impact of this was that it accentuated a trend of greater contact of the traditional and indigenous populations with the cities. Today, the number of people from traditional communities living or spending much of their time in cities is far greater than it was 20-30 years ago. This brings about a very marked cultural change. Customs have changed. Many families no longer plant their traditional crops and feed themselves with ever-increasing volumes of food from the cities. This has a direct impact on the risk of loss of traditional varieties planted and managed. At the same time as the laws seek to preserve the culture of traditional and indigenous populations, it has generated cultural changes that have affected this preservation, with a great (negative) effect on the biodiversity of food and agriculture.

Today, the greatest risk factor for loss of food and agricultural biodiversity of traditional and indigenous communities is the rapid cultural change that is under way. If they are not using or feeding as much of their traditional foods as they have in the past, the demand for maintenance of these foods also declines. We note with concern the increase in cases of projects which the goals for recovery traditional species for the communities. This reflects some scenarios: first, an increase in loss of food security; second, a concern in rescuing traditional foods; third, these projects as a means of bringing money into the community in order to maintain the new customs in a circle that affects the preservation of traditional foods.

**18. Which drivers have had the most significant effect on the role of biodiversity for food and agriculture in improving food security and sustainability? (Fonte: Rel. Biodiv. MMA)**

- National Network of Plant Genetic Resources: implemented in 2009 by Embrapa Genetic Resources and Biotechnology, with the objective of modernizing the management and coordination of projects on plant genetic resources, in order to better satisfy the current and future national demands for plant germplasm. Special emphasis is given to the improvement, conservation, characterization, documentation and availability of native and exotic germplasm to improve Brazilian food security. The following initiatives are part of this Network: (i) Germplasm Active Banks for Cereals; Vegetables; Forage Plants; Fruit species; Medicinal, Aromatic, Dyes and Insecticidal Species; Ornamental; Forest and Palm species; Industrial Species; Legumes, Oilseeds and Fibers; Roots and Tubers; (ii) Collection of plant genetic resources and associated systematic studies; (iii) Conservation of medium and long-term plant collections; (iv) In situ and on-farm conservation of genetic resources in traditional and indigenous communities; (v) Vegetable Network; and (vi) Complementary activities of the Plant Network.

- Network for the Conservation and Use of Animal Genetic Resources: with the objective of mapping and preserving local or naturalized creole breeds that are threatened with extinction and which have very important characteristics of rusticity and adaptability for genetic improvement programs in Brazil. The project also aims at (i) the enrichment of the BGA, (ii) the enrichment of the DNA bank, and (iii) the documentation and computerization of these Banks. It is also the goal of the project to maintain a minimum number of animals from each of the breeds conserved as germplasm donors, and serve to raise awareness of the importance of conservation of animal genetic resources.

- Plants for the Future Initiative: the initiative is a set of actions aimed at identifying, prioritizing and disseminating information on native plant species of current or potential economic importance. The initiative involves the participation of more than 500 researchers from public and private institutions, as well as representatives from different spheres of federal, state and municipal governments, farmers and industry, in the identification of species that can be economically exploited in a sustainable way and respecting the peculiarities and the culture of each region of the country (North, Northeast, Central West, Southeast and South). Until July 2017, more than 700 native species have been prioritized throughout the country. Information on potential species in each region has been systematized and is being published in a series of five books, one for each geoeconomic region of the country, two already published (South and Center-West) and three to be published in 2018 (Northeast, North and Southeast). The main objective of this initiative is to list species in different use groups (food, medicinal, aromatic, timber, oilseed, fibrous, etc.) that can diversify the portfolio of family farming products and ensure food and nutritional security, especially in poorest regions in Brazil. It is observed that in the last 10 years, considering the performance of researchers involved in the Plants for the Future Initiative in the different regions, the use of native species in food has been growing significantly, facilitating the population's access to a more diversified diet, with a greater appreciation of native biodiversity.

- Biodiversity for Food and Nutrition (BFN): a project involving Brazil, Kenya, Sri Lanka and Turkey, aimed at "Integrating the Conservation and Sustainable Use of Biodiversity

for Improved Nutrition and Human Well-being.". The project supports research on the role of biodiversity in nutrition and also aims to provide information on the nutritional benefits of traditional foods to human health. In Brazil, the BFN project seeks to increase the cultivation of native species currently used as food; mitigate the problems related to simplified diets; increase the genetic and food production base; promote the sustainable management of agrobiodiversity; and strengthen the country's food and nutritional sovereignty. The project has established partnerships with a number of existing national initiatives to implement various actions: Food Acquisition Program (PAA); National School Feeding Program (PNAE); National Food and Nutrition Policy (PNAN); National Plan for the Promotion of Socio-Biodiversity Product Chains (PNPSB); National Plan for Agroecology and Organic Production (PLANAPO); and Minimum Price Guarantee Policy for Sociobiodiversity Products (PGPMBio).

- The Sectorial Plan for Mitigation and Adaptation to Climate Change for the Consolidation of a Low Carbon Emission Economy in agriculture (ABC Plan): coordinated by the Ministry of Livestock and Supply, aims to organize and plan the actions to be taken to adopt sustainable production technologies, selected to meet commitments to reduce greenhouse gas emissions in the agricultural sector assumed by the country. The ABC Plan is composed of seven programs, six of which are related to mitigation technologies, and one last program with actions to adapt to climate change: Program 1: Recovery of Degraded Pastures; Program 2: Integration of Tillage-Livestock-Forest (iLPF) and Agroforestry Systems (SAFs); Program 3: Direct Planting System (SPD); Program 4: Biological Fixation of Nitrogen (BNF); Program 5: Planted Forests; Program 6: Treatment of Animal Waste; Program 7: Adapting to Climate Change.

- Public policies (National Plan for Food Acquisition, General Policy on Minimum Prices of Socio-biodiversity and National School Feeding Program) have contributed to promoting the market for biodiversity products, thus increasing the income of rural communities. In addition, the creation of conservation units, the recognition and demarcation of indigenous lands and quilombola territories contributes to preserving fragments of land for sustainable use, including the exploitation of biodiversity products, thus ensuring food security and sustainability.

- Planted forests (*Eucalyptus* forests in the North of Minas Gerais State). Once traditional population have had their traditional territory occupied by planted forests, people are self-organizing to counter (fight back) territory, biodiversity, and traditional knowledge losses.

Others drivers that have had most influence in improving food security and sustainability are:

- Legislation: recognition of new groups of traditional people, with rights guarantee to access and use of species from the environment and new territorial delineation.

- Ecoturism: there was an increasing recognition and appreciation of traditional and indigenous populations in Brazil and, consequently, generated a greater

demand of the so-called "ecological tourism", where tourists go to those areas seeking for an experience with a different culture and a more preserved, wild environment. This stimulates environmental preservation and strengthens components of their culture.

- Market and conservation: Traditional populations are collecting forest seeds on their land in order to sell them to landowners who need to recover degraded areas. This market encourages conservation of seed matrices and, at the same time, recovers areas usually found close of the reserves areas.

- Market: There was an increased on the demand for certified products, ecologically sustainable, free from agrochemicals, and greater valorization and diffusion of agroforestry systems. Big cosmetics companies are associating their products with a greener "footprint" by buying part of the raw material of their commercial products with traditional products.

**Countermeasures addressing current and emerging drivers of change, best practices and lessons learned**

**19. Referring to the information provided in this Chapter, identify countermeasures planned or in place to reduce adverse consequences of drivers on a) associated biodiversity, b) ecosystem services and c) wild foods. Provide any expected outcomes, lessons learned and best practices.**

- Adoption of the No-Tillage System, of the Crop-Livestock-Forest Integration System and of technologies for better use and for management of lands.

- The series Notebooks from Family Farming (http://www.mda.gov.br/sitemda/publica%C3%A7%C3%B5es-s%C3%A9rie-cadernos-da-agricultura-familiar) by the Special Secretariat for Family Agriculture and Agrarian Development (SEAD) aimed at promoting the sustainable use of biodiversity in agroecological production.

- The Ministry of Agriculture, in partnership with the Ministry of Environment, published a series of nine booklets on best practices for the collection of wild foods with guidelines for the improved use of biodiversity. The booklets have the potential of promoting organic certification for wild foods that are sustainably collected. They present practical tools and information for collectors, associations, cooperatives and capacity building professionals. The series is being expanded in 2017 for 21 new species.

- The GEF Pollinators Project, during its execution, contributed to disseminate the following pollinator friendly practices include: a) to recover Areas of Permanent Preservation and Legal Reserve[18] with attractive plants to pollinators; b) to keep attractive plants in the vicinity of plantations as well as trap-nests for nesting bees (landscape design and enrichment); c) do not apply pesticide during the flowering season, neither immediately before the flourishing or when pollinators are visiting the crop; d) do not destroy nests and sites for nesting/reproduction of pollinators; e) distribute rational

[18] Areas of Permanent Preservation and Legal Reserve are legal requirements in the Law n. 12.651/ 2012, available on http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12651.htm; access on 15th May 2017.

bee nests in the vicinity of plantations; f) to keep attractive plants at gardens, zoos and public squares; f) to keep attractive plants at lanes parallel to highways.

- Mapping and identification of invasive exotic species in Inland water: The Ministry of Environment has been investing in the inventory of current and potential invasive alien species present in Brazil. This effort resulted, among other actions, in the publication of the book Exotic Invasive Species of Continental Waters in Brazil in the year 2016 (http://www.mma.gov.br/publicacoes/biodiversidade/category/56-especies-exoticas-invasoras). This publication provides an overview of invasive alien species and will contribute to action planning and decision making to prevent introduction, control and monitoring that should be observed by the various sectors involved in the use of inland water ecosystems and the biological resources in them.

- Investments in policies and actions aiming at improvements in productivity, reducing the conversion of natural habitats to areas of agriculture or pasture: Between 1990/1991 and 2009/2011, the total area planted with grains grew 30%, while production increased by 150%. Advances were also obtained in cattle ranching, where a study concluded that the pasture area needed for a single head was on average 1.96 hectares in 1970, having reduced to 0.93 hectares per animal in 2006, although this may reflect measures of optimization of soil use, instead of indicating better productivity resulting from genetic improvement. There is an increase in the adoption of techniques for the recovery of degraded pastures, crop rotation, soil fertility restoration, pasture composition and efficient management of herds. These practices may result in increases in livestock production within existing pastures, especially if they are associated with existing techniques of genetic improvement of the herd.

- Preventing and fighting fires: In order to strengthen the prevention and control of forest fires in Brazil, the revision of the former Forest Code (now replaced by Law 12.651 / 2012) requires that landowners request permission from state environmental agencies to use fire in their areas. In addition, it establishes that all environmental agencies (federal, state and municipal) that make up the National Environmental System - SISNAMA must update and implement contingency plans to control forest fires, and that the federal government should establish a national policy of management, prevention and control of forest fires. Another measure was the creation of the Integrated Multi-Agency Center for Operational Cooperation - CIMAN began its activities in June 2014, with the objective of coordinating efforts among the federal agencies that work in the direct fight against forest fires.

- Water and soil pollution control: In its efforts to reduce water pollution, since 2012 Brazil has been promoting the revision of the legal structure and has been adopting new policy instruments through the National Council of the Environment - CONAMA. Examples of this are: the publication of Decree 8.127 / 2013, on the National Contingency Plan for Incidents of Oil Pollution in Waters under National Jurisdiction; and CONAMA Resolution No. 454/2012 which regulates dredging practices with the aim of reducing the impact on fishing activities and ensuring proper handling and disposal of dredged

materials to reduce contamination of the aquatic environment with heavy metals and polycyclic aromatic hydrocarbons.

- The GEF "Mainstreaming Biodiversity Conservation and Sustainable Use into NTFP and AFS production practices in Multiple-Use Forest Landscapes of High Conservation Value" Project has contributed to ensure that the biodiversity of Brazilian multiple-use forest landscapes of high conservation value is conserved through a strengthened sustainable use management framework for non-timber forest products (NTFP) and agroforestry systems (AFS).

## CHAPTER 3: The state and trends of biodiversity for food and agriculture

***Proposed structure of the Chapter and information to be included in the Country Reports***

The main objective of this Chapter is to describe the state of biodiversity for food and agriculture in the country, with an emphasis on associated biodiversity and wild foods, and to identify current trends. The Chapter should also indicate current gaps and future needs and priorities. Where possible, countries should identify interventions required to support maintenance of associated biodiversity and indicate whether action is required at local, national, regional or global levels.

This Chapter will seek information on the following topics:

- The state of diversity between and (where any information exists) within species with respect to associated biodiversity and wild foods;
- The importance of the different components of associated biodiversity in relation to ecosystem services;
- The main factors influencing the state of genetic diversity with an emphasis on threatened and endangered species and resources;
- The state of activities and of the development of monitoring and information systems on the state of biodiversity for food and agriculture;
- The state of any specific conservation actions that target associated biodiversity and wild foods;
- Major gaps in the information available and opportunities and priorities for improving knowledge of state and trends of biodiversity for food and agriculture.

Where possible, indicate whether the information systems are gender-sensitive, specifying to what extent the different types and levels of knowledge of women and men are taken into account.

*IMPORTANT: Throughout these guidelines, questions on production systems will refer to the production systems identified in Chapter 1, Table 1 as present in your country. When referring to them in your answers, please provide the production system code and/or full name as found in Table 1.*

*One of the main objectives of this report is to identify knowledge gaps and to provide baseline information for future assessments. Thus please indicate where information is unavailable.*

***Overall synthesized assessment of forest, aquatic, animal or plant genetic resources***

Countries that previously presented or are currently preparing a Country Report on Forest, Aquatic, Animal or Plant Genetic Resources may have important information on genetic diversity in these various reports. Therefore, Countries may wish to take full advantage of their different sector reports to develop a comprehensive description and comparison of the state, trends, and state of conservation of forest, aquatic, animal or plant genetic resources. The following indications are designed to provide guidance on the topics that could be addressed.

**20. Describe the overall 1) state, 2) trends and 3) state of conservation of diversity of forest, aquatic, animal or plant genetic resources in your country with respect to:**

a) common characteristics shared by all sectors;
b) major differences between sectors;
c) synergies or trade-offs in the state of diversity between sectors.

The responses should include relevant information on socio-economic, political and cultural dimensions as well as biological ones. Information on the significance of common characteristics, differences, synergies and trade-offs with respect to achieving food security and nutrition, sustainable production or the provision of ecosystem services should also be provided.

- Several programs have been implemented by the National Institute of Space Research and Embrapa, in partnership with the ministry of environment, with the objective of monitoring deforestation in Brazil. One of the examples is TerraClass project (http://www.inpe.br/cra/projetos_pesquisas/dados_terraclass.php), whose main objective is to understand the dynamics of use and coverage of Brazilian Legal Amazon. With these results it is possible to make an evaluation of the dynamics of the use and occupation of deforested areas in these 10 years. With these results it is possible to make an evaluation of the dynamics of use and occupation of deforested areas in these 10 years.

- Adoption of the Biodiversity Conservation Index as a more accurate assessment parameter, which is calculated based on the number of endangered species, area covered by protected areas and indigenous lands, vegetation cover remnants, and the number of ex situ conservation areas. The index is calculated for each Brazilian state and ranges from 0 to 1, with the lowest values indicating worse situations of biodiversity conservation.

Ministry of the Environment in partnership with several national and international organizations has implemented a series of actions aimed at guaranteeing environmental goods and services such as:

- Establishment of priority areas for conservation, a work begun in 1997 that culminated in the creation of the National System of Conservation Units in 2000 and currently has 959 Conservation Units, divided into twelve subgroups of use, spread throughout Brazil.

- Payment for environmental services: (i) carbon sequestration; (ii) landscapes conservation; (iii) biodiversity conservation; (iv) water resources and services

conservation; (v) climate regulation; (vi) valuation of traditional knowledge; (vii) improvement and conservation of soil; (viii) the maintenance of Areas of Permanent Preservation (APP) and Legal Reserves (RLs) of restricted use.

- Certification of companies, farmers and products based on an assessment of the impacts caused to biodiversity by its activities and processes. Several companies have already been certified based on the use of internationally recognized good practices. In the field, the number of Producers who joined the Organic Production System increased, making organic production stand out as an alternative to increase the income of small-scale rural producers and improve the quality of life and of the environment.

- Bolsa Floresta is a pioneering and innovative initiative that involves payment for environmental services in the state of Amazonas. Since 2007, the program has been rewarding and improving the quality of life of traditional communities that live not only within the forest but also derive their livelihood from it, and are committed to reducing deforestation. The program is internationally certified and serves more than 35,000 people in 15 state protected areas in an area of 10 million hectares of Amazon rainforest.

- The Bolsa Verde Program to Support Environmental Conservation, which was created by Law no. 12,512 / 2011 and grants quarterly benefits of R $ 300 in the form of financial assistance to families in extreme poverty living in areas considered a priority for environmental conservation.

- The Pollinators Project aims to improve food and nutritional security as well as quality of life through the conservation and sustainable use of pollinators. The project aims to develop an integrated database on the services of wild pollinators; disseminate agricultural practices that respect pollinators; sensitize and empower farmers and land managers on the importance of pollinators; and to integrate into other sectors the conservation and sustainable use of pollinators.

- Natural Capital Initiative of Brazil: (i) identify and emphasise the benefits of conservation and sustainable use of biodiversity, as well as estimate the costs of their loss; (ii) promote the integration of ecosystems and biodiversity economics into decision-making processes; and (iii) influence the implementation of public policies and management instruments, as well as behavioral changes to guarantee the supply of natural resources in the long term.

- Monitoring, through the Water Quality Index (IQA) established by the National Water Agency (ANA), of the quality of water used for public supply after undergoing conventional treatment. Constant monitoring also of water use, currently having agricultural irrigation as the sector with the greatest demand for water in Brazil. Constant monitoring also of water use, currently having agricultural irrigation as the sector with the greatest demand for water in Brazil.

- Coastal, marine and continental aquatic resources have aroused much debate, considering the urgency of conservation actions in oceans and the intensification of human actions in this environment. The establishment of standards for shared use of marine environment is under discussion in order to achieve the sustainability of its innumerable resources, taking into account the government interests and with beneficial effects for human society and marine ecosystems.

About the knowledge of Brazilian biodiversity, three large databases are currently available for online consultation:

- Flora do Brasil 2020 is an integral part of the Reflora Program and is being carried out with the support of the Brazilian Biodiversity Information System (SiBBr). Currently, the system registers 46,458 identified species for the Brazilian flora, being 4,753 of Algae, 33,066 of Angiosperms, 1,562 of Bryophytes, 5,720 of Fungi, 30 of Gymnosperms and 1,327 of Ferns and Lyophytes (http://floradobrasil.jbrj.gov.br/reflora/listaBrasil/ConsultaPublicaUC/ConsultaPublicaUC.do#CondicaoTaxonCP).

- The Taxonomic Catalog of Brazilian Fauna, which involves more than 500 researchers in zoology and resulted in the identification, to date, of 117,219 animal species known to Brazil, being 85% arthropods, 10% chordates and 5% other invertebrate species. (http://fauna.jbrj.gov.br/fauna/listaBrasil/PrincipalUC/PrincipalUC.do?lingua=pt).

Regarding flora and fauna threatened with extinction, two major projects are important to mention:

- Animal: The Chico Mendes Institute for Biodiversity Conservation (ICMBio) coordinates the processes for updating the Official National Lists of Endangered Species of Wildlife involves an assessment of the conservation status of all vertebrate species occurring in Brazil, as well as of some invertebrates which can act as indicators of environmental quality, such as mollusks, crustaceans, corals, bees and butterflies (http://www.icmbio.gov.br/portal/faunabrasileira).

- Vegetal: National Center for vegetal Conservation (CNCFlora), installed in the Botanical Garden of Rio de Janeiro, which coordinates great effort to evaluate the conservation state of Brazilian plant species (http://cncflora.jbrj.gov.br/portal).

Regarding the conservation of agrobiodiversity, Embrapa Genetic Resources and Biotechnology, continuously develops several researches on plant animal and microorganism genetic resources, such as ex situ conservation activities directed at Brazilian native species of current or potential use, which include the maintenance of a national collection of genetic samples. Currently the information of germplasm collections is being migrated and made available in a database for public consultation (https://www.embrapa.br/alelo).

***State and trends of associated biodiversity and ecosystem services***

This section seeks information on the state of associated biodiversity in different production systems and in relation to the provision of regulating and supporting ecosystem services. Annex 1 provides a description of the components of associated biodiversity and Annex 4 a description of the ecosystem services.

**21. Have any changes been detected in your country for the different production systems over the last 10 years in components of associated biodiversity? If so, indicate if trends are strongly increasing (2), increasing (1), stable (0), decreasing (-1) or strongly decreasing (-2) in Table 7. If no information is available, indicate not known (NK). If not applicable, (NA).**

**Table 7.** Trends in the state of components of associated biodiversity within production systems.

| **Production system** | **Trends in last 10 years (2,1,0,-1,-2, NK, NA)** | | | |
|---|---|---|---|---|
| Code or name | Micro-organisms | Invertebrates | Vertebrates | Plants |
| Livestock grassland-based systems: Tropics | -2 | -2 | -2 | -2 |
| Livestock grassland-based systems: Subtropics | -2 | -2 | -2 | -2 |
| Livestock grassland-based systems: Temperate | -2 | -2 | -2 | -2 |
| Livestock landless systems: Tropics | -2 | -2 | -2 | -2 |
| Livestock landless systems: Subtropics | -2 | -2 | -2 | -2 |
| Livestock landless systems: Temperate | -2 | -2 | -2 | -2 |
| Naturally regenerated forests: Tropics | 1 | 1 | 1 | 1 |
| Naturally regenerated forests: Subtropics | 1 | 1 | 1 | 1 |
| Naturally regenerated forests: Temperate | 1 | 1 | 1 | 1 |
| Planted forests: Tropics | -2 | -2 | -2 | -2 |
| Planted forests: Subtropics | -2 | -2 | -2 | -2 |
| Self-recruiting capture fisheries: Tropics | NK | NK | NK | NK |
| Self-recruiting capture fisheries: Subtropics | NK | NK | NK | NK |
| Culture-based fisheries: Tropics | NK | NK | NK | NK |
| Culture-based fisheries: Subtropics | NK | NK | NK | NK |
| Fed aquaculture: Tropics | NK | NK | NK | NK |
| Fed aquaculture: Subtropics | NK | NK | NK | NK |
| Non-fed aquaculture: Tropics | NK | NK | NK | NK |
| Non-fed aquaculture: Subtropics | NK | NK | NK | NK |
| Irrigated crops (rice): Tropics | -2 | -2 | -2 | -2 |
| Irrigated crops (rice): Subtropics | -2 | -2 | -2 | -2 |
| Irrigated crops (other): Tropics | -2 | -2 | -2 | -2 |
| Irrigated crops (other): Subtropics | -2 | -2 | -2 | -2 |
| Rainfed crops: Tropics | -2 | -2 | -2 | -2 |
| Rainfed crops: Subtropics | -2 | -2 | -2 | -2 |
| Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics | -1 | -1 | -1 | -1 |
| Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics | -1 | -1 | -1 | -1 |
| Mixed forests | 0 | 0 | 0 | 0 |
| Organic systems | 0 | 0 | 0 | 0 |
| Extractive systems | 0 | 0 | 0 | 0 |

**22. Briefly describe the changes or trends in diversity recorded in Table 7. Where possible provide information on: baseline levels (last 10 years, indicate if otherwise), measurements and indicators used, the extent of change, and the likely cause(s). Include references to the sources of information.**

**23. Have any changes been detected in your country for the different production systems over the last 10 years in regulating and supporting ecosystem services? If so, indicate if trends are strongly increasing (2), increasing (1), stable (0), decreasing (-1) or strongly decreasing (-2) in Table 8. If no information is available, indicate not known (NK). If not applicable, (NA).**

**Table 8.** Trends in the state of regulating and supporting ecosystem services within production systems.

| **Production systems** | **Trends in last 10 years (2,1,0,-1,-2, NK, NA)** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Code or name | Pollination | Pest and disease regulation | Water purification and waste treatment | Natural hazard regulation | Nutrient cycling | Soil formation and protection | Water cycling | Provisioning of habitat | Production of oxygen/ Gas regulation | Others: [*please specify*] |
| Livestock grassland-based systems: Tropics | -2 | -2 | -2 | -2 | -1 | -1 | -1 | -1 | -2 | |
| Livestock grassland-based systems: Subtropics | -2 | -2 | -2 | -2 | -1 | -1 | -1 | -1 | -2 | |
| Livestock grassland-based systems: Temperate | -2 | -2 | -2 | -2 | -1 | -1 | -1 | -1 | -2 | |
| Livestock landless systems: Tropics | -2 | -2 | -2 | -2 | -1 | -1 | -1 | -1 | -2 | |
| Livestock landless systems: Subtropics | -2 | -2 | -2 | -2 | -1 | -1 | -1 | -1 | -2 | |
| Livestock landless systems: Temperate | -2 | -2 | -2 | -2 | -1 | -1 | -1 | -1 | -2 | |
| Naturally regenerated forests: Tropics | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | |
| Naturally regenerated forests: Subtropics | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | |
| Naturally regenerated forests: Temperate | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | |
| Planted forests: Tropics | -1 | -1 | -1 | -1 | -1 | -1 | -1 | 0 | 2 | |
| Planted forests: Subtropics | -1 | -1 | -1 | -1 | -1 | -1 | -1 | 0 | 2 | |
| Self-recruiting capture fisheries: Tropics | NK | NK | NK | NK | NK | NK | NK | NK | NK | |
| Self-recruiting capture fisheries: Subtropics | NK | NK | NK | NK | NK | NK | NK | NK | NK | |
| Culture-based fisheries: Tropics | NK | NK | NK | NK | NK | NK | NK | NK | NK | |
| Culture-based fisheries: Subtropics | NK | NK | NK | NK | NK | NK | NK | NK | NK | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Fed aquaculture: Tropics | NK | NK | NK | NK | NK | NK | NK | NK | NK | |
| Fed aquaculture: Subtropics | NK | NK | NK | NK | NK | NK | NK | NK | NK | |
| Non-fed aquaculture: Tropics | NK | NK | NK | NK | NK | NK | NK | NK | NK | |
| Non-fed aquaculture: Subtropics | NK | NK | NK | NK | NK | NK | NK | NK | NK | |
| Irrigated crops (rice): Tropics | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -1 | |
| Irrigated crops (rice): Subtropics | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -1 | |
| Irrigated crops (other): Tropics | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -1 | |
| Irrigated crops (other): Subtropics | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -1 | |
| Rainfed crops: Tropics | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -1 | |
| Rainfed crops: Subtropics | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -1 | |
| Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | 0 | |
| Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | 0 | |
| Mixed forests | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | |
| Organic systems | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | |
| Extractive systems | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | |

**24. Briefly describe the changes or trends in diversity recorded in Table 8. Where possible provide information on: baseline levels (last 10 years, indicate if otherwise), measurements and indicators used, the extent of change, and the likely cause(s). Include references to the sources of information.**

**25. Is there evidence that changes in biodiversity for food and agriculture have impacted ecosystem services in your country? Indicate if strongly increasing (2), increasing (1), stable (0), decreasing (-1) or strongly decreasing (-2) in Table 9 and provide a description of specific situations and documentation where available (repeat table for each production system).**

**Table 9.** Impact of changes in biodiversity for food and agriculture on ecosystem services.

| **Production systems** | **Changes** | **Impact of changes in biodiversity for food and agriculture on ecosystem services** (2, 1, 0,-1, -2, NK, NA) |
|---|---|---|

| Code or name | | Pollination | Pest and disease regulation | Water purification and waste treatment | Natural hazard regulation | Nutrient cycling | Soil formation and protection | Water cycling | Habitat provisioning | Production of oxygen/ Gas regulation |
|---|---|---|---|---|---|---|---|---|---|---|
| Livestock; Forests; Aquaculture and Fisheries; Crops; Mixed; Mixed forests; Extractive systems; Organics systems | Changes in animal genetic resources | NK | NK | NK | NK | NK | NK | NK | -2 | NK |
| | Changes in crop genetic resources | NK | NK | NK | NK | NK | NK | NK | -2 | NK |
| | Changes in forest genetic resources | NK | NK | NK | NK | NK | NK | NK | -2 | NK |
| | Changes in aquatic genetic resources | NK | NK | NK | NK | NK | NK | NK | -2 | NK |
| | Changes in micro-organism genetic resources (associated biodiversity) | NK | NK | NK | NK | NK | NK | NK | -2 | NK |
| | Changes in invertebrates genetic resources (associated biodiversity) | NK | NK | NK | NK | NK | NK | NK | -2 | NK |
| | Changes in vertebrates genetic resources (associated biodiversity) | NK | NK | NK | NK | NK | NK | NK | -2 | NK |
| | Changes in plants genetic resources (associated biodiversity) | NK | NK | NK | NK | NK | NK | NK | -2 | NK |

**26. Briefly describe the impacts on ecosystem services recorded in Table 9. Where possible provide information on: baseline levels (last 10 years, indicate if otherwise), measurements and indicators used, the extent of change, and the likely cause(s). Include references to the sources of information.**

**27. List any associated biodiversity species or sub-species (if information is available) that are in some way actively managed in your country to help provide regulating or supporting ecosystem services in Table 10. Indicate in which production systems they occur and indicate if diversity information is available. Provide any available sources of information.**

**Table 10.** Associated biodiversity species that are in some way actively managed in your country to help provide regulating or supporting ecosystem services.

| Ecosystem service provided | Actively managed species (name) and sub-species (where available) | Production systems (code or name) | Availability of diversity information (Y/N) | Source of information |
|---|---|---|---|---|
| Pollination | *Apis mellifera, Bombus morio; Centris aenea; Epicharis flava; Eulaema;* | Naturally regenerated forests: | Y | Pollinators Project Pires et al. (2016), Viana (2015) |

| | | | | |
|---|---|---|---|---|
| | *Melipona quadrifasciata nigrita; Melipona scutellaris; Nannotrigona testaceicornis; Tetragonisca angustula; Trigona spinipes; Xylocopa frontalis; Xylocopa grisescens* | Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems | | |
| Pest and disease regulation (plants) | Plants: *Salvia officinalis; Rosmarinus officinalis; Tanacetum vulgare; Tagetes spp.; Calendula officinalis; Coriandrum sativum; Chrysanthemum cinerariaefolium; Nicotiana tabacum; Derris spp., Lonchocarpus spp.; Tephrosia spp.; Azadirachta indica; Cymbopogon spp.; Pinus spp.; Eugenia caryophyllata; Mentha piperita; Piper nigrum; Allium spp.; Chenopodium ambrosioides; Ageratum conyzoides* | Livestock systems<br>Naturally regenerated forests:<br>Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems | Y | Embrapa Hortaliças; Embrapa Meio Ambiente; Embrapa Fruticultura; Tropical and Embrapa Agrobiologia Databases.<br><br>Saito, M.L. Plantas praguicidas. 2004. |
| Pest and disease regulation (microrganisms)* | *Metarhizium anisopliae* s.s. (target pest – cercopids) | Livestock grassland-based systems: Tropics<br><br>Rainfed crops: Tropics | Y | Agrofit (2017); Goble et al. (2017); Li et al. (2010); Lopes et al. (2013a,b); Michereff Filho et al. (2009); Parra (2014); Rocha et al. (2013); van Lenteren et al. (2017) |
| | *Beauveria bassiana* s.l. (target pest – whitefly and spider mite) | Organic systems<br><br>Extractive systems | | Agrofit (2017); Faria & Wraight (2007); van Lenteren et al. (2017) |
| | *Trichoderma* spp. (target disease – soil-borne fungal pathogens) | Rainfed crops: Tropics<br>Organic systems<br>Extractive systems | NK | Agrofit (2017); Bettiol (2011); Bettiol et al. (2012) |
| | *Trichogramma* spp. (target pest – lepidopterans) | Rainfed crops: Tropics<br>Extractive systems | NK | Parra & Zucchi (2004); Parra et al. (2011); Parra (2014) |
| | *Cotesia flavipes* (target pest – *Diatraea saccharalis*) | Rainfed crops: Tropics | NK | Parra et al. (2011); Parra (2014) |
| | *Baculovirus anticarsia* (target pest – *Anticarsia* | Rainfed crops: Tropics | NK | Moscardi & Sósa-Gomez (2000); |

| | | | | |
|---|---|---|---|---|
| | *gemmatalis*) | | | Moscardi et al. (2002); Alves & Lopes (2008); Haase et al. (2015) |
| | *Aphidius colemani* (target pests- Cereal aphids (*Schizaphis graminum, Rhopalosiphum padi and Metopolophium dirhodum*) | Rainfed crops: Tropics<br>Livestock grassland-based systems: Subtropics | Y | Sturza et al. (2012) |
| | *Telenomus podisi* (target species: Nezara viridula and other pentatomids) | Rainfed crops: Tropics | Y | Doetzer & Foerster (2007) |
| | *Trissolcus basalis* (Nezara viridula and other pentatomids | Planted forests: Tropics | Y | Doetzer & Foerster (2007) |
| | *Anaphes nitens* (target pest – *Leptocybe invasa*) | NK | NK | Sanches (2000) |
| | *Macrocentrus ancylivorus* (target PEST –*Grapholita molesta* | NK | NK | NK |
| | *Bacillus* spp.<br>(native and exotic isolates) (target disease- aerial and soil-borne plant pathogens) | Rainfed crops: Tropics<br>Organic systems<br>Extractive systems | NK | Agrofit (2007); Dorighello et al. (2015); Moreira et al.(2014) |
| | *Bacillus thuringiensis* (native and exotic isolates) (target pest-lepidopterans) | Rainfed crops: Tropics<br>Organic systems<br>Extractive systems | NK | Agrofit (2007); Perini et al (2016) |
| | *Neoseiulus californicus* (McGregor, 1954) predatory mite in the Phytoseiidae family (target pests – two spotted spider mite *Tetranychus urticae*)<br>Obs: origin not detemined, probably an American species, endemic or naturalized in Brazil occurring on cultivated and wild host plants. | Apple orchards and outher fruit trees; strawberry and other vegetables; ornamentals (roses and other cut flowers) - protected and unprotected crops | Y | Monteiro (1994), Monteiro et al. (2002); Sato et al. (2002a,b; 2007); Poletti et al. (2006); Okassa et al. (2011); Poletti & Omoto (2012) |
| | *Phytoseiulus macropilis* (Banks, 1904) predatory mite in the Phytoseiidae family (target pests – two spotted spider mite *Tetranychus urticae*)<br>Obs: origin not detemined, probably an American species, endemic or naturalized in Brazil occurring on cultivated and wild host plants. | Vegetables (strawberry, cucumber) and ornamentals (roses and other cut flowers) - protected and unprotected crops | Y | Moraes et al. (1990); Watanabe et al. (1994); Poletti et al. (2006); Okassa et al. (2010); Poletti & Omoto (2012); Oliveira et al. (2009) |

| | | | | |
|---|---|---|---|---|
| | *Stratiolaelaps scimitus* (Womersley) predatory mite in the Laelapidae family (target pests – "fungus gnat" *Bradysia* spp. (Diptera: Sciaridae); Western flower thrips, *Frankliniella occidentalis (Thripidae).* | Mushroom cultures; seedlings nursery (citrus, eucaliptus, tobacco, vegetables and flowers) | N | Mineiro & Moraes (2001); Freire et al. (2007); Castilho et al. (2009); Moreira & Moraes (2015) |
| | *Typhlodromalus aripo* De Leon, 1967 predatory mite in the Phytoseiidae family (target pests – cassava green mite, *Mononychellus tanajoa*) | Rainfed crops: Tropics<br><br>Cassava culture | N | Moraes et al. (1990); Hanna et al. (1998); Yaninek & Hanna (2003) |
| Water purification and waste treatment | *Moringa oleifera; Limnocharis flava; Echinodorus* spp.*; Equisetum arvense; Typha domingensis; Salvinia molesta; Eichhornia crassipes; Victoria amazonica; Aponogeton crispus; Eleocharis calva; Cyperus* spp.<br>*Pistia stratiotes* | Aquaculture and fisheries<br>Irrigated crops; Mixed systems; Mixed forests; Organic systems; Extractive systems | Y | Embrapa Instrumentação Database |
| Natural hazard regulation | *Desmodium* spp.; *Arachis* spp. (controle natural do fogo e contenção de taludes); *Chrysopogon zizanioides* (controle erosão) | Livestock systems<br>Naturally regenerated forests:<br>Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems | Y | Emater – RS and Embrapa Solos Databases |
| Nutrient cycling | *Azorhizobium* spp; *Azospirillum brasilense*; *Bacillus subtilis*; *Bradyrhizobium* spp.; *Frauteria aurantia*; *Mesorhizobium* spp.; *Rhizobium* spp.; *Sinorhizobium* spp. | Livestock systems<br>Naturally regenerated forests:<br>Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems | Y | |
| Soil formation and protection; nutrient cycling; water cycling; habitat | *Avena* spp.; *Cajanus cajan*; *Canavalia ensiformis*; *Cicer arietinum*; *Crotalaria* spp.; *Dolichos lablab*; *Glycine max*; *Helianthus annuus*; | Livestock systems<br>Naturally regenerated forests: | Y | Ministry of Agriculture, Livestock and Supply. Bancos comunitários de |

| | | | | |
|---|---|---|---|---|
| provisioning; production of oxygen/ gas regulation | *Lathyrus sativus*; *Leucaena leucocephala*; *Lollium multiflorum*; *Lupinus* spp.; *Mucuna* spp.; *Pennisetum glaucum*; *Pisum sativum*; *Prosopis juliflora*; *Raphanus sativus*; *Secale cereale*; *Sorghum* spp.; *Tithonia diversifolia*; *Triticum aestivum*; *Vicia sativa*; *Vigna* spp.; *Vigna angularis*; *Vigna unguiculata*; *Zea mays* | Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems | | sementes de adubos verdes: Brasília: MAPA, 2007. |
| Pastures for pollinators | *Anacardium occidentale; Myracrodruon urundeuva; Spondias tuberosa; Copernicia prunifera; Handroanthus impetiginosus; Cochlospermum vitifolium; Cordia oncocalyx; Commiphora leptophloeos; Cynophalla flexuosa; Crateva tapia; Combretum leprosum; Cnidoscolus quercifolius; Croton sonderianus; Libidibia ferrea; Poincianella bracteosa; Senna macranthera; Anadenanthera colubrina; Pityrocarpa moniliformis; Mimosa arenosa; Mimosa caesalpinifolia; Mimosa tenuiflora; Mimosa scabrella; Senegalia polyphylla; Amburana cearensis; Ziziphus joazeiro; Solanum paniculatum; Hyptis suaveolens; Lantana camara; Ipomoea* spp. *Stylosanthes* spp.*; Chamaecrista* spp.*; Mimosa* spp. | Naturally regenerated forests: Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems | Y | Guia de plantas visitadas por abelhas na Caatinga. Maia-Silva, C. et al. 1.ed Fortaleza, CE; 2012 |
| Recovery of degraded ecosystems (pastures, riparian forest, legal reserve area) | *Arachis* spp.; *Calopogonium* spp.; *Centrosema* spp.*; Desmodium* spp.; *Dipteryx alata*; *Genipa americana*; *Handraonthus* spp.; *Hymenaea* spp.; *Paspalum* spp.; *Psidium* spp.; *Stylosanthes* spp.; *Urochloa* spp.; *Tabebuia aurea*; | Livestock systems Naturally regenerated forests: Planted forests; Aquaculture and fisheries Irrigated crops; | Y | Ministry of Environment. Plants for the Future Initiative Database.<br><br>Vieira, R.F. et al. Espécies Nativas da Flora Brasileira |

| | | | | |
|---|---|---|---|---|
| | *Eugenia* spp.; *Opuntia elata; Passiflora* spp.; *Schinus terebinthifolius; Araucaria angustifolia; Aspidosperma polyneuron; Balfourodendron riedelianum; Cedrela fissilis; Colubrina glandulosa; Enterolobium contortisiliquum; Miconia cinnamomifolia; Mimosa scabrella; Nectandra lanceolata; Parapiptadenia rigida; Piptocarpha angustifolia; Vernonanthura discolor; Bauhinia forficata; Cecropia glaziovii; Croton celtidifolius; Jacaranda* spp.; *Syagrus* spp.; | Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems | | de Valor Econômico Atual ou Potencial – Plantas para o Futuro – Região Centro-Oeste. MMA: 2016.<br><br>Coradin, L. et al. Espécies nativas da flora brasileira de valor econômico atual ou potencial: plantas para o futuro - Região Sul. Brasília: MMA, 2011. |

**28. Does your country have monitoring activities related to associated biodiversity? If yes, describe these. Where possible provide information on the components of associated biodiversity that are monitored and on the geographical coverage of the monitoring system (local, regional, national, global). Include references to the sources of information, if possible.**

- MAPA has Agrofit that lists the target pests (microorganisms, arthropods and pests, diseases, and weeds) and the biological control organisms that are registered in the system (http://agrofit.agricultura.gov.br/agrofit_cons/principal_agrofit_cons).

- SIBBr will host the Biodiversity Nutrition Composition Database (http://www.sibbr.gov.br/areas/index.php?area=uso&subarea=alimentacao-e-nutricao) and contains the tool " Species Sheet "(https://ferramentas.sibbr.gov.br/ficha/bin/view/especie/) with information on taxonomy, natural history, distribution, ecological importance and state of conservation of Brazilian species accompanied by records and images.

- Alelo Embrapa. Portal for services and management of data and information on Genetic Resources in Brazil, maintained by Embrapa – Brazilian Company of Agricultural Research. Contains passport data, statistics, characterization and evaluation of materials kept in germplasm banks. (http://alelobag.cenargen.embrapa.br/AleloConsultas/Conservacao/capacidade.do).

- The Ministry of the Environment maintains the Research Network on Pollination and Sustainable Management of Pollinators - POLINFRUT, as part of the research, teaching and extension activities developed by the Network in the municipalities of Ibicoara and Mucugê, Bahia, within the scope of the project "Conservation and Management of Pollinators for Sustainable Agriculture through the Ecosystem Approach "(FAO / GEF /

UNEP / FUNBIO). This project is supported by the Global Environment Facility (GEF) and is implemented in seven countries: Brazil, South Africa, India, Pakistan, Nepal, Ghana and Kenya. The project is coordinated at the global level by the United Nations Food and Agriculture Organization (FAO), with support from the United Nations Environment Program (UNEP). In Brazil, it is coordinated by the Ministry of the Environment (MMA), with support from the Brazilian Biodiversity Fund (FUNBIO).

***Species of associated biodiversity at risk of loss***

In this section the objective is to identify species of associated biodiversity within the country that are at significant risk of loss, degradation or extinction.

**29. List in**

**Table** 11 **any components of associated biodiversity for which there is evidence of a significant threat of extinction or of the loss of a number of important populations in your country. Specify the degree of the threat according to the classification in use in your country or following the IUCN Red List Categories and Criteria**[19]**. Include a description of the threat and list references or sources of information if available.**

**Table 11.** Main threats to associated biodiversity identified as at risk.

| **FAUNA** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Associated biodiversity species (taxonomic group)** | **Degree of threat** | | | | | **Main threat (indicate)** | **References or sources of information if available** |
| | Category/ Threatened | | | | | | |
| | EW | CR | EN | VU | Total | | |
| Mammalia | - | 12 | 43 | 35 | 110 | **<u>Continental species:</u>** habitat loss and degradation; the direct removal of individuals from nature; agricultural and livestock activities; impact linked to the generation and transmission of energy (Amazon biome); urban sprawl (Atlantic Forest and Pampa biomes)<br><br>**<u>Marine species:</u>** uncontrolled fishing; habitat degradation; pollution (physical, chemical, noise and light); maritime shipping; urbanization of coastal regions and tourism-related activities | Ministry of Environment. Brazil Red Book of Threatened Species of Fauna (2016)* |
| Aves | 1 | 42 | 71 | 120 | 243 | | |
| Reptilia | - | 10 | 50 | 20 | 80 | | |
| Amphibia | - | 18 | 12 | 11 | 41 | | |
| Myxini | - | - | - | 1 | 1 | | |
| Elasmobranchii (saltwater) | - | 27 | 8 | 19 | 54 | | |
| Elasmobranchii (freshwater) | - | 1 | - | - | 1 | | |
| Actinopteri (saltwater) | - | 7 | 6 | 29 | 42 | | |
| Actinopteri (freshwater) | - | 100 | 112 | 99 | 311 | | |
| Invertebrates (terrestrial) | - | 83 | 81 | 69 | 233 | | |
| Invertebrates (freshwater) | - | 12 | 16 | 9 | 37 | | |
| Invertebrates (saltwater) | - | 6 | 7 | 16 | 29 | | |
| Species total | 1 | 318 | 406 | 448 | 1173 | | |

[19] IUCN (International Union for Conservation of Nature) (2012). IUCN Red List Categories And Criteria, Version 3.1 Second edition http://jr.iucnredlist.org/documents/redlist_cats_crit_en.pdf

* The extinction risk for 8.922 vertebrates and 3.332 invertebrates comprising 18 groups was assessed. Over 72% of species were categorized as Least Concern while 9,7% were either assigned under one of the extinction risks or as extinct.

| **FLORA** | | | | | | |
|---|---|---|---|---|---|---|
| **Associated biodiversity species (Botanical family)*** | **Degree of threat** | | | | **Main threat (indicate)** | **References or sources of information if available** |
| | Category | | | | | |
| | VU* | EN* | CR* | Total | | |
| Acanthaceae | 6 | 15 | 1 | 22 | Habitat loss (Agriculture and silviculture, management of non agricultural areas, extraction of natural resources, infractructure and development, invasive species, native species dynamics change, fire); human disturbance; intrinsic fators; extraction; natural disaster; pollution; invasive species; change in species dynamics | CNCFlora – National Center for Flora Conservation<br><br>Ministry of Environment<br><br>Portaria 443 de 17 de dez. 2014.** |
| Alismataceae | 1 | - | - | 1 | | |
| Alstromeriaceae | - | 5 | 2 | 7 | | |
| Amaranthaceae | 4 | 9 | 1 | 14 | | |
| Amaryllidaceae | 6 | 16 | 7 | 29 | | |
| Anacardiaceae | - | 2 | - | 2 | | |
| Anemiaceae | 4 | - | - | 4 | | |
| Annonaceae | 2 | 9 | 4 | 15 | | |
| Apiaceae | 3 | 7 | 3 | 13 | | |
| Apocynaceae | 13 | 31 | 3 | 47 | | |
| Aquifoliaceae | 1 | - | 2 | 3 | | |
| Araceae | 4 | 5 | - | 9 | | |
| Araliaceae | 1 | 4 | 1 | 6 | | |
| Araucariaceae | - | 1 | - | 1 | | |
| Arecaceae | 12 | 4 | 2 | 18 | | |
| Aristolochiaceae | 1 | 1 | - | 2 | | |
| Arnelliaceae | - | 1 | 1 | 2 | | |
| Aspleniaceae | - | 2 | 3 | 5 | | |
| Asteraceae | 54 | 143 | 41 | 238 | | |
| Begoniaceae | 1 | 25 | 9 | 35 | | |
| Berberidaceae | 1 | - | 1 | 2 | | |
| Bignoniaceae | 3 | 14 | 6 | 23 | | |
| Blechnaceae | 2 | 1 | 1 | 4 | | |
| Bromeliaceae | 29 | 112 | 60 | 201 | | |
| Bruchiaceae | - | 1 | - | 1 | | |
| Burseraceae | 2 | 7 | - | 9 | | |
| Cactaceae | 19 | 45 | 11 | 75 | | |
| Caloplyllaceae | - | 1 | 3 | 4 | | |
| Calyceraceae | - | 2 | - | 2 | | |
| Campanulaceae | - | 2 | 1 | 3 | | |
| Caprifoliaceae | 2 | 2 | 1 | 5 | | |
| Celastraceae | 3 | 3 | 3 | 9 | | |
| Chrysobalanaceae | 2 | 9 | 4 | 15 | | |
| Cistraceae | - | 1 | - | 1 | | |
| Clusiaceae | - | 1 | - | 1 | | |
| Combretaceae | 1 | 1 | 1 | 3 | | |
| Commelinaceae | 2 | 2 | 1 | 5 | | |
| Connaraceae | - | 2 | - | 2 | | |
| Convolvulaceae | 7 | 6 | 1 | 14 | | |
| Crassulaceae | - | - | 1 | 1 | | |
| Cyclanthaceae | 1 | - | - | 1 | | |
| Cyperaceae | 5 | 4 | 3 | 12 | | |
| Dichapetalaceae | - | 1 | 1 | 2 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Diksoniaceae | - | 1 | - | 1 | | |
| Dicranaceae | - | 3 | - | 3 | | |
| Dilleniaceae | 1 | 1 | 1 | 3 | | |
| Dioscoreaceae | 2 | 3 | 1 | 6 | | |
| Ditrichaceae | - | 1 | - | 1 | | |
| Droseraceae | - | 1 | - | 1 | | |
| Dryopteridaceae | 1 | 3 | 1 | 5 | | |
| Elaeocarpaceae | - | 1 | - | 1 | | |
| Ephedraceae | 1 | - | - | 1 | | |
| Ericaceae | 1 | 4 | 4 | 9 | | |
| Eriocaulaceae | 4 | 5 | 3 | 12 | | |
| Erythroxylaceae | 2 | 7 | 2 | 11 | | |
| Escalloniaceae | 1 | 1 | - | 2 | | |
| Euphorbiaceae | 5 | 8 | 5 | 18 | | |
| Fabaceae | 39 | 37 | 10 | 86 | | |
| Gelsemiaceae | 1 | - | - | 1 | | |
| Gentianaceae | - | 5 | - | 5 | | |
| Gesneriaceae | 9 | 21 | 3 | 32 | | |
| Gunneraceae | - | 1 | - | 1 | | |
| Hedwigiaceae | 1 | - | - | 1 | | |
| Humiriaceae | - | - | 1 | 1 | | |
| Hymenophyllaceae | - | - | 2 | 2 | | |
| Hypericaceae | 1 | - | - | 1 | | |
| Iridaceae | - | 5 | 5 | 10 | | |
| Isoetaceae | - | 2 | - | 2 | | |
| Jungermanniaceae | - | - | 1 | 1 | | |
| Lamiaceae | 9 | 22 | 3 | 34 | | |
| Lauraceae | 14 | 17 | 5 | 36 | | |
| Lecythidaceae | 1 | 10 | - | 11 | | |
| Lejeuneaceae | 1 | 3 | - | 4 | | |
| Lentibulariaceae | 1 | 1 | - | 2 | | |
| Lepidoziaceae | - | - | 1 | 1 | | |
| Linaceae | - | 1 | - | 1 | | |
| Loasaceae | - | - | 1 | 1 | | |
| Logoniaceae | 1 | 6 | 1 | 8 | | |
| Lycopodiaceae | 1 | 10 | 4 | 15 | | |
| Lythraceae | 5 | 7 | 9 | 21 | | |
| Malpighiaceae | 14 | 31 | 18 | 63 | | |
| Malvaceae | 1 | 7 | 2 | 10 | | |
| Marantaceae | 2 | 3 | - | 5 | | |
| Marchantiaceae | - | 1 | - | 1 | | |
| Marsileaceae | 1 | - | - | 1 | | |
| Melastomataceae | 19 | 36 | 12 | 67 | | |
| Meliaceae | 5 | 3 | 1 | 9 | | |
| Metzgeriaceae | - | 1 | - | 1 | | |
| Monimiaceae | 1 | 3 | - | 4 | | |
| Moraceae | 1 | 2 | 1 | 4 | | |
| Myristicaceae | 3 | 1 | - | 4 | | |
| Myrtaceae | 20 | 48 | 10 | 78 | | |
| Ochnaceae | 4 | 1 | - | 5 | | |
| Oleacea | 1 | - | 2 | 3 | | |
| Orchidaceae | 55 | 60 | 52 | 167 | | |
| Orobanchaceae | 2 | 4 | 3 | 9 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Oxalidaceae | 1 | 3 | 8 | 12 | | |
| Pallaviciniaceae | - | 1 | - | 1 | | |
| Passifloraceae | - | 5 | 1 | 6 | | |
| Pentaphylacaceae | 1 | - | - | 1 | | |
| Phyllantaceae | 1 | - | - | 1 | | |
| Phytolaccaceae | 1 | 1 | - | 2 | | |
| Picramniaceae | - | 1 | - | 1 | | |
| Piperacea | 5 | 18 | 4 | 27 | | |
| Plagiochilaceae | - | 1 | - | 1 | | |
| Plantaginaceae | 2 | 2 | 4 | 8 | | |
| Poaceae | 7 | 31 | 24 | 69 | | |
| Podocarpaceae | 1 | - | 1 | 2 | | |
| Podostemaceae | 2 | 1 | 1 | 4 | | |
| Polygalaceae | 1 | 3 | - | 4 | | |
| Polypodiaceae | 2 | 8 | 9 | 18 | | |
| Portulacaceae | - | 1 | - | 1 | | |
| Pottiaceae | 1 | - | - | 1 | | |
| Primulaceae | - | 5 | - | 5 | | |
| Proteaceae | 2 | 5 | - | 7 | | |
| Pteridaceae | 2 | 19 | 4 | 25 | | |
| Quillajaceae | - | 1 | - | 1 | | |
| Rhamnaceae | 3 | 5 | - | 8 | | |
| Ricciaceae | - | - | 1 | 1 | | |
| Rubiaceae | 13 | 23 | 13 | 49 | | |
| Rutaceae | 2 | 5 | 7 | 14 | | |
| Salicaceae | 2 | - | - | 2 | | |
| Santalaceae | 1 | - | - | 1 | | |
| Sapindaceae | 4 | 1 | 2 | 7 | | |
| Sapotaceae | 9 | 12 | 2 | 25 | | |
| Scrophulariaceae | - | 1 | - | 1 | | |
| Selaginellaceae | 1 | - | - | 1 | | |
| Simaroubaceae | 1 | 3 | 2 | 6 | | |
| Smilacaceae | 1 | 4 | - | 5 | | |
| Solanaceae | 3 | 15 | 5 | 23 | | |
| Symplocaceae | - | 4 | 1 | 5 | | |
| Thelyopteridaceae | 1 | 2 | 2 | 5 | | |
| Trigoniaceae | 1 | - | - | 1 | | |
| Tropaeolaceae | - | 1 | - | 1 | | |
| Urticaceae | 1 | - | 1 | 2 | | |
| Velloziaceae | - | 21 | 6 | 27 | | |
| Verbenaceae | 5 | 9 | - | 14 | | |
| Violaceae | - | 4 | 3 | 7 | | |
| Vittaceae | 1 | 1 | - | 2 | | |
| Vochysiaceae | 1 | 6 | - | 7 | | |
| Xyridaceae | 1 | 13 | 12 | 26 | | |
| Zingiberaceae | - | 1 | - | 1 | | |

*CR: Critically endangered; EN: Endangered; VU: Vulnerable.

** Considering the Official National List of Endangered Species of Flora (Ministry of Environment, Ordinance 443/2014).

### *Conservation of associated biodiversity*

This section collects information on the state of conservation of components of associated biodiversity providing ecosystem services within production systems in your country.

**30. Does your country currently have any *ex situ* conservation or management activities or programmes for associated biodiversity for food and agriculture? These may include, for example, culture collections, collections of pollinators, etc. If so, list these in Table 12.**

- In the late 1970s and the early 1980s, there was felt a need at Cenargen for a system that would foster integration of its internal activities with those carried out in Active Germplasm Banks and, above all, promote an interaction between active banks. To this end, the Active Germplasm Banks Coordination was created. Initially this was made up of three Cenargen researchers, whose mission was to bolster integration between different genetic resources activities, carried out by Cenargen itself or by any other unit or institution. This has now evolved into the current Embrapa Germplasm Curatorship System. These activities developed gradually, always keeping a global vision of genetic resources for a product or in a group of products. As a pioneering system, it took over one decade for it to consolidate. The system was often discussed and assessed, notably because it was not a formal system, but survived in this form for a number of years, proving increasingly efficient and consistent. In view of this performance, in 1993, the Executive Board of Embrapa deemed it important and opportune to establish a corporate official system with the specific goal of giving legitimacy to germplasm management activities. And so was created the Germplasm Curatorship System in 1993. In 1999, this system was expanded and improved. Its goal is to: "define, systematize and integrate all indispensable activities for germplasm management, conservation and use within the Corporation in the context of the Embrapa program for the Conservation and Use of Genetic Resources".

- Organizational Structure of the Germplasm Curatorship System: The Embrapa Germplasm Curatorship System is structured as follows: (a) a System Supervisor directly reporting to the Head of Research and Development at Embrapa Genetic Resources and Biotechnology; (b) Product or product group Curators, a category in which all are currently from Embrapa Genetic Resources and Biotechnology; (c) Germplasm Bank Curators, from the Embrapa Units that hold germplasm banks. The Supervisor of the Curatorship System is chosen by the Director General of Embrapa Genetic Resources and Biotechnology, and appointed by the President of Embrapa. Product or product group Curators and Assistant Curators are chosen by the Supervisor of the Curatorship System; for their appointment, a Service Order signed by the Director General of Embrapa Genetic Resources and Biotechnology is required. Germplasm Bank Curators are chosen by the Director of the Units holding the respective bank and appointed by the President of Embrapa. As of 2008, there where 38 Product or Product Group Curators, 35 Assistant Curators, and 111 Germplasm Bank Curators, as well as Ad hoc Curators, for a total of about 200 people. Due to the very large diversity of important plant, animal and microorganism products in Brazil, and the impossibility of having one Curator for each product at Embrapa Genetic Resources and Biotechnology, the Supervisor of the Curatorship System assembled similar products together into ten groups, which are then divided into subgroups and/or individual products. Each one of the subgroups or products constitutes a curatorship, which is under the responsibility of a Curator and, in some cases,of an Assistant Curator (Table 5).

- This system is under review. The system will be splited in tree sub-systems: animal, microorganisms and plants, which one with a Supervisor, and one of them being the

Coordinator of the system. The product or product group Curators will not exist anymore. The Genetic Bank, that comprises the mid- and long-term collections of animal, microorganisms and plant genetic resources, will be curated by a Supervisor.

- Another institution that organized its genetic resources collection in a curatoship system is Agribusiness Technology of Sao Paulo (APTA). The collections are distributed among three institutes: Agronomic Institute, Biological Institute and Zootechny Institute. It comprises 16 collections of plants [Germplasm Collection of Fiber Plants; Germplasm Collection of Oil Plants; Germplasm Collection of Cereals and Bean; Germplasm Collection of Roots and Tubers; Germplasm Colletion of Sugarcane; Germplasm Colletion of Stimulating Plants; Germplasm Colletion of Fruits; Germplasm Colletion of Citrus; Germplasm Colletion of Leguminoses and Green Fertilizers; Germplasm Colletion of Sorghum, Corn and Popcorn; Germplasm Colletion of Vegetables, Aromatic and Medicinal Plants; Germplasm Colletion of Rubber Tree; Germplasm Colletion of Zingiberales Ornamentals; Germplasm Colletion of Arecaceae; Germplasm Colletion of Forage Plants]; 21 of pests and microorganisms [Mite Collection of Agricultural Interest Geraldo Calcagnolo; Antisera Collection Against Phytopathogenic Bacteria of Plant Bacteriology; Collection of Arthropods of Medical and Veterinary Importance; Collection of Cultures of Trichoderma Isolates from the Laboratory of Biochemistry-Phytopathology; Collection of Bacterial Strains from the Laboratory of General Bacteriology; Collection of Phytobacter Cultures; DNA Collection of Phytopathogenic Bacteria; Collection of DNA and cDNA from the Phytopathological Biochemistry Laboratory; Collection of Freeze-Dried Plant Extract Extracts; Phytovirus Collection Karl Silberschmidt; Collection of Entomophages Insect Oscar Monte; Collection of Rabies Virus Isolates and Aujeszky's Disease; Viral Strains of the Bovine Viruses Laboratory; *Phaeosphaeria maydis* Fungus Isolate Collection; Collection of Entomopathogenic Fungi Oldemar Cardim Abreu; Collection of Entomopathogenic Nematodes from the Biological Control Laboratory; Collection of Nematodes Parasites of Coffee; Entomological Collection Adolph Hempel; Phytopathological and Uredinological Herbarium Collection of the Phytopathological Mycology Laboratory; Fungi Collection Mário Barreto Figueiredo] and 2 of cattle and sheep (Guzerá, Caracu and Nelore Collection; IZ Coleção de Ovinos)

The largest and most significant ex situ conservation work in Brazil is led by Embrapa Genetic Resources and Biotechnology, in Brasilia / DF. Currently data related to the conservation of germplasm in the country can be checked in the portal Alelo (http://alelo.cenargen.embrapa.br). However, it is important to point out that data related to several germplasm collections in Brazil have not yet been fully migrated to the new portal and thus, for some species or group of organisms (plants, animals or microorganisms), the data presented are only partial. Therefore, any differences observed do not mean loss of number of accesses conserved, but only that the data were not completely available in the portal.

**Table 12.** Ex situ conservation or management activities or programmes for associated biodiversity for food and agriculture.

| Organisms, species and sub-species (where available) conserved | Size of collection | Conservation conditions | Objective(s) | Characterization and evaluation status |
|---|---|---|---|---|
| **Components of associated biodiversity: PLANTS** | | | | |

| | | | | |
|---|---|---|---|---|
| Rice | 27050 | seeds | conservation, research, breeding | Genetical diversity, ecology, geographic distribution, molecular analisys |
| Oats | 480 | seeds | | |
| Rye | 116 | seeds | | |
| Barley | 2314 | seeds | | |
| Millet | 1740 | seeds | | |
| Corn | 3922 | seeds | | |
| Subtropical corn | 132 | seeds | | |
| Sorghum | 7215 | seeds | | |
| Wheat | 15118 | seeds | | |
| Triticale | 290 | seeds | | |
| Cotton | 896 | seeds | | |
| Peanut | 228 | seeds | | |
| Peanut forage | 92 | field | | |
| Arachis wild relatives | 1300 | seeds | | |
| Canola | 94 | seeds | | |
| Safflower | 911 | seeds | | |
| *Cuphea* spp. | 58 | seeds | | |
| Pea | 837 | seeds | | |
| Bean | 16447 | seeds | | |
| Cowpea beans | 3942 | seeds | | |
| Sesame | 1433 | seeds | | |
| Sunflower | 2060 | seeds | | |
| Cashew | 650 | seeds | conservation, research, breeding | |
| Moringa | 23 | field | | |
| Olive | 50 | field | | |
| Pinhão-manso (*Jatropha curcas*) | 189 | seeds and field | | |
| Sisal | 37 | field | | |
| Soybean | 18024 | seeds | | |
| Lettuce | 50 | seeds | | |
| Garlic | 144 | field | | |
| Eggplant | 783 | seeds | | |
| Brassicaceae | 100 | seeds | | |
| Pimentas (*Capsicum* spp.) | 2078 | seeds | | |
| Onion | 201 | seeds | | |
| Carrot | 74 | seeds | | |
| Cucurbitaceae | 480 | seeds | | |
| Pumpkins | 3089 | seeds | | |
| Unconventional vegetables | 85 | field | | |
| *Arracacia xanthorriza* | 55 | field | conservation, research, breeding | |
| Watermelon | 369 | seeds | | |
| Melon | 325 | seeds | | |
| Cucumber | 1482 | seeds | | |
| Black pepper | 10 | seeds | | |
| Okra | 270 | seeds | | |
| *Solanum* spp. (wild relatives) | 333 | seeds | | |
| Tomato | 1100 | seeds | | |

| | | | | |
|---|---|---|---|---|
| *Mendicago* spp. | 148 | seeds and field | | |
| *Lolium multiflorum* | 240 | seeds | | |
| *Brachiaria* spp. | 670 | field | | |
| *Cenchrus ciliaris* | 117 | seeds | | |
| *Pennisetum* spp. | 111 | seeds and field | | |
| *Desmanthus* spp. | 109 | seeds and field | | |
| Forages of importance to the Amazon Region | 210 | seeds | | |
| Forages of importance for the Southern Region | 148 | seeds and field | | |
| Forages of importance for the Cerrado | 5538 | seeds | | |
| Forages of importance to the Pantanal | 55 | field, green house | conservation, research, breeding | |
| *Panicum maximum* | 430 | seeds and field | | |
| *Paspalum* spp. | 318 | seeds and field | | |
| *Stylosanthes* spp. | 1308 | seeds | | |
| Pineapple (*Ananas* spp.) | 624 | field, in vitro | | |
| Curauá-fiber (*Ananas* spp.) | 58 | field | | |
| Bacuri (*Platonia insignis*) | 172 | field | | |
| Baru (*Dipteryx alata*) | 17 | field | | |
| Cashew (*Anacardium* spp.) | 588 | field, green house | | |
| Camu-camu (*Myrciaria dúbia*) | 120 | field | | |
| Brazil nuts (*Bertholletia excelsa*) | 10 | field | | |
| Cupuaçu (*Theobroma grandiflorum*) | 610 | field | | |
| Fruit trees native to the Mid North Region | 112 | field | | |
| Native fruit trees of the North Region | 17 | field | | |
| Native fruit trees of the Southern Region | 76 | field | | |
| Jenipapo (*Genipa americana*) | 172 | field | | |
| Mangaba (*Hancornia speciosa*) | 281 | field | conservation, research, breeding | |
| Passion fruit (*Passiflora* spp.) | 418 | seed, field, green house | | |
| Muruci (*Byrsonima crassifólia)* | 17 | field | | |
| Pequi (*Caryocar brasiliense)* | 15 | field | | |
| Pitaya | 43 | field | | |
| *Spondias* spp. | 133 | field | | |
| Avocado | 39 | field | | |

| | | | | |
|---|---|---|---|---|
| Acerola (*Malpighia* spp.) | 156 | field | | |
| Banana (*Musa* spp.) | 259 | field | | |
| *Citrus* spp. | 647 | green house | | |
| Apple | 444 | field | | |
| Pear | 200 | field | | |
| Papaya | 243 | seeds and field | | |
| Mango | 532 | field | | |
| Strawberry | 20 | green house, in vitro | | |
| Prunoids | 200 | field | | |
| Araçá (*Psidium* spp.) | 160 | seeds and field | | |
| Kiwi | 25 | field | | |
| Grape | 1642 | field, in vitro | | |
| Amburana (*Amburana cearensis*) | 62 | field | | |
| Espinheira-santa (*Maytenus* spp.) | 159 | field | | |
| Fennel, ginseng-Brazilian, guago, Lippia, ora-pro-nobis | 423 | seed, field, in vitro | | |
| Medicinal, Biocidal and Aromatic Properties of Amaz. Western | 38 | field | conservation, research, breeding | |
| Medicines from the Eastern Amazon | 108 | field and in vitro | | |
| Medicinal products of importance for the Cerrado | 110 | field | | |
| Mint | 75 | field, green house and in vitro | | |
| Indian Nim (*Azadirachta indica*.) | 45 | field | | |
| *Piper* (Long Pepper and Monkey Pepper) | 3021 | field | | |
| Timbo (*Derris* spp.) | 52 | field | | |
| Urucum (*Bixa orellana*) | 15 | field | | |
| Cane | 200 | field | | |
| Guarana | 270 | field | | |
| Bromeliads | 161 | green house | | |
| Cactaceae | 166 | green house | conservation, research, breeding | |
| Ornamental trees of importance to the Northeast Region | 145 | green house | | |
| Ornamental of importance for the North Region | 23 | green house | | |
| Ornamental of importance for the Pampa Biome | 17 | green house | | |
| Ornamental Bulbs | 150 | green house | | |
| Orchids | 200 | bulbs, green house | | |
| *Pachira quinata* | 17 | field | | |

| | | | | |
|---|---|---|---|---|
| Conifer and Hardwoods | 772 | field | | |
| *Eucalyptus spp.* | 62 | seeds, field | | |
| *Pinus spp.* | 932 | seeds, field | | |
| Rubber tree | 868 | field | | |
| Açai (*Euterpe* spp.) | 304 | field | | |
| Babaçu (*Attalea* spp.) | 100 | field | | |
| Bacaba (*Oenocarpus* spp.) | 253 | field | | |
| Caiaue (*Elaeis oleífera*) | 239 | field | | |
| Palm oil (*Elaeis guineenses*) | 329 | field | | |
| Inajá (*Maximiliana maripa*) | 63 | field | | |
| Macaúba (*Acrocomia aculeata*) | 100 | field | | |
| Pupunha (*Bactris gasipaes*) | 60 | field | | |
| Pupunha (INPA) (*Bactris gasipaes*) | 375 | field | | |
| Tucumã (*Astrocaryum* spp.) | 182 | field | | |
| Coconut (*Cocos nucifera*) | 36 | field | | |
| Buriti (*Mauritia flexuosa*) | 30 | field | | |
| Potato | 410 | field | | |
| Sweet potato | 860 | field, green house | | |
| Cassava (*Manihot esculenta*) | 3962 | field | | |
| *Manihot* (wild relatives) | 600 | field | | |

| **Organisms, species and sub-species (where available) conserved** | **Size of collection** | **Conservation conditions** | **Objective(s)** | **Characterization and evaluation status** |
|---|---|---|---|---|
| **Components of associated biodiversity: ANIMALS** | | | | |
| **Asininos** | 151 | Purified DNA | conservation, research and breeding | Phenotypic and genetic characterization of germplasm; evaluation of productive potential; ecology; reproductive strategies (fishes); genetical diversity |
| **Bubalinos** | 638 | Purified DNA | | |
| **Caprinos** | 1221 | Purified DNA | | |
| **Equinos** | 794 | Purified DNA | | |
| **Gado de leite** | 3013 | Purified DNA | | |
| **Gado de corte** | 226 | Purified DNA | | |
| **Galináceos** | 188 | Purified DNA | | |
| **Ovinos** | 4519 | Purified DNA | | |
| **Peixes de água doce** | 158 | Purified DNA | | |
| **Peixes marinhos** | 123 | Purified DNA | | |
| **Quelônios** | 273 | Purified DNA | | |
| **Suinos** | 606 | Purified DNA | | |
| **Asininos** | 5 | Sperm | | |
| **Caprinos** | 48 | Sperm | | |
| **Equinos** | 12 | Sperm | | |
| **Gado de corte** | 141 | Sperm | | |
| **Ovinos** | 65 | Sperm | | |

| | | | | |
|---|---|---|---|---|
| **Suinos** | 14 | Sperm | | |

| **Organisms, species and sub-species (where available) conserved** | **Size of collection** | **Conservation conditions** | **Objective(s)** | **Characterization and evaluation status** |
|---|---|---|---|---|
| **Components of associated biodiversity: MICRORGANISMS** | | | | |
| Ascomycota | 38 | Preserved unit: Varies according to the type pf micro-organism. In the case of fungi, they may be different types of spores or other structures of reproductive or vegetative origin. Vegetative cells such as mycelium or yeasts are less common but also work for some species that do not produce spores or stay only in the yeast stage.<br><br>In the bacteria conservation can be used vegetative cells or spores, in the case of the sporulants.<br><br>Conditions: cryopreservation, cooling, dehydration. | Conservation, research, breeding, development of products for the medical, pharmaceutical and industrial área, genetic engineering | Genetic characterization of germplasm; ecology; biological control; development of products (agricultural, medical, pharmaceutical and industrial uses) |
| Bacteria (without identification) | 3 | | | |
| Hypocreales | 2 | | | |
| Acetobacteraceae | 274 | | | |
| Acidithiobacillaceae | 1 | | | |
| Actinomycetaceae | 21 | | | |
| Alcaligenaceae | 10 | | | |
| Amphisphaeriaceae | 1 | | | |
| Atheliaceae | 10 | | | |
| Azotobacteraceae | 4 | | | |
| Bacillaceae | 2623 | | | |
| Beijerinckiaceae | 2 | | | |
| Bionectriaceae | 37 | | | |
| Botryosphaeriaceae | 209 | | | |
| Bradyrhizobiaceae | 1 | | | |
| Brucellaceae | 7 | | | |
| Burkholderiaceae | 652 | | | |
| Campylobacteraceae | 6 | | | |
| Cellulomonadaceae | 1 | | | |
| Ceratobasidiaceae | 2 | | | |
| Ceratocystidaceae | 4 | | | |
| Chlorellaceae | 39 | | | |
| Clavicipitaceae | 612 | | | |
| Comamonadaceae | 5 | | | |
| Cordycipitaceae | 566 | | | |
| Corticiaceae | 1 | | | |
| Corynesporascaceae | 1 | | | |
| Davidiellaceae | 20 | | | |
| Debaryomycetaceae | 76 | | | |
| Dermateaceae | 14 | | | |
| Diaporthaceae | 23 | | | |
| Elsinoaceae | 10 | | | |
| Enterobacteriaceae | 229 | | | |
| Enterococcaceae | 10 | | | |
| Fabaceae | 5 | | | |
| Glomerellaceae | 3114 | | | |
| Halothiobacillaceae | 8 | | | |
| Hyphomicrobiaceae | 5 | | | |
| Hypocreaceae | 1822 | | | |
| Incertae sedis | 5 | | | |
| Lactobacillaceae | 5 | | | |
| Magnaporthaceae | 11217 | | | |
| Methylobacteriaceae | 30 | | | |
| Metschnikowiaceae | 4 | | | |
| Microbacteriaceae | 3 | | | |

| | | | | |
|---|---|---|---|---|
| Microbacteriaceae | 61 | | | |
| Micrococcaceae | 1 | | | |
| Mortierellaceae | 6 | | | |
| Mucoraceae | 2 | | | |
| Mycobacteriaceae | 4 | | | |
| Mycoplasmataceae | 5 | | | |
| Mycosphaerellaceae | 533 | | | |
| Nectriaceae | 1316 | | | |
| Nocardioidaceae | 1 | | | |
| Not assigned | 177 | | | |
| Burkholderiales | 4 | | | |
| Ophiocordycipitaceae | 13 | | | |
| Ophiostomataceae | 4 | | | |
| Orbiliaceae | 7 | | | |
| Oxalobacteraceae | 158 | | | |
| Paenibacillaceae | 27 | | | |
| Pasteurellaceae | 61 | | | |
| Phyllobactereaceae | 23 | | | |
| Phyllobacteriaceae | 32 | | | |
| Pichiaceae | 360 | | | |
| Planistromellaceae | 1 | | | |
| Plectosphaerellaceae | 1 | | | |
| Pleosporaceae | 63 | | | |
| Pseudanabaenaceae | 3 | | | |
| Pseudomonadaceae | 132 | | | |
| Pucciniaceae | 14 | | | |
| Pythiaceae | 68 | | | |
| Rhizobiaceae | 2792 | | | |
| Rhodocyclaceae | 5 | | | |
| Rhodospirillaceae | 732 | | | |
| Saccharomycetaceae | 622 | | | |
| Saccharomycodaceae | 1167 | | | |
| Saccharomycopsidaceae | 42 | | | |
| Saccotheciaceae | 2 | | | |
| Sclerotiniaceae | 53 | | | |
| Sclerotiniaceae | 126 | | | |
| Sphingomonadaceae | 9 | | | |
| Sporidiobolales | 27 | | | |
| Staphylococcacea | 294 | | | |
| Streptococcaceae | 129 | | | |
| Streptomycetaceae | 4 | | | |
| Togniniaceae | 3 | | | |
| Tremellaceae | 9 | | | |
| Trichocomaceae | 261 | | | |
| Trichomonascaceae | 21 | | | |
| Valsaceae | 1 | | | |
| Venturiaceae | 69 | | | |
| Xanthobactereaceae | 27 | | | |
| Xanthomonadaceae | 153 | | | |
| Xylariaceae | 67 | | | |
| unclassified Oscillatoriales | 2 | | | |

**31. Does your country currently have any *in situ* conservation and management activities or programmes in your country that support the maintenance of associated biodiversity? If so provide any available information on organisms and species managed or conserved, site name and location, production system(s) involved, conservation objective and specific actions that secure associated biodiversity or ecosystem services (if any).**

**Table 13.** In situ conservation or management activities or programmes for associated biodiversity for food and agriculture.

| **Components of associated biodiversity** | **Organisms, species and sub-species (where available) conserved** | **Site name and location** | **Production system(s) involved (code or name)** | **Conservation objective(s)** | **Specific actions that secure associated biodiversity or ecosystem services** |
|---|---|---|---|---|---|
| Micro-organisms | | | | | |
| Invertebrates | | | | | |
| Vertebrates | | | | | |
| Plants | | | | | |

In situ conservation in Brazil is carried out through a network of Conservation Units and is generally applied to wild populations of plants and animals living in protected areas, and may also include areas under productive management and multiple uses, if extractive reserves and sustainable development.

The National System of Conservation Units (SNUC) was created in 2000 through Federal Law n. 9,985/2000. Formed by a set of federal, state and municipal conservation units, divided into 12 categories, as described in the table below. SNUC aims to: contribute to the conservation of biological species varieties and genetic resources within national territory and in jurisdictional waters; protect threatened species from extinction; contribute to the preservation and recovery of natural ecosystems diversity; promote sustainable development from natural resources; promote the use of nature conservation principles and practices in the development process; protect natural and little altered landscapes of remarkable scenic beauty; protect relevant geological, morphological, geomorphological, speleological, archaeological, paleontological and cultural characteristics; recover or restore degraded ecosystems; provide means and incentives for activities of scientific research, studies and environmental monitoring; valuing biological diversity economically and socially; favor conditions and promote education, environmental interpretation and recreation in contact with nature; protect the natural resources necessary for the subsistence of traditional populations, respecting and valuing their knowledge and culture and promoting them socially and economically.

**Table 13. Consolidated table of Conservation Units in Brazil.**

| **Category** | **Sphere** | | | | | | **Total** | |
|---|---|---|---|---|---|---|---|---|
| | **National** | | **State** | | **Municipal** | | | |
| | N° | Area (km²) | N° | Area (km²) | N° | Area (km²) | N° | Area (km²) |
| **Integral protection** | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ecologica Station | 32 | 74.947 | 61 | 47.596 | 4 | 10 | 97 | 122.552 |
| Natural Monument | 3 | 443 | 29 | 906 | 14 | 136 | 46 | 1.485 |
| Parks | 73 | 264.867 | 206 | 94.200 | 127 | 443 | 406 | 359.510 |
| Wildlife Refuge | 8 | 2.692 | 41 | 2.941 | 5 | 161 | 54 | 5.794 |
| Biological Reserve | 31 | 42.677 | 23 | 13.447 | 8 | 51 | 62 | 56.174 |
| **Total Integral protection** | **147** | **385.625** | **360** | **159.089** | **158** | **801** | **665** | **545.515** |
| **Sustainable use** | | | | | | | | |
| Forest | 67 | 178.25 | 39 | 135.856 | 0 | 0 | 109 | 314.081 |
| Extractive Reserve | 62 | 124.724 | 28 | 19.867 | 0 | 0 | 90 | 144.591 |
| Sustainable Development Reserve | 2 | 1.206 | 32 | 111.251 | 5 | 171 | 39 | 112.447 |
| Fauna Reserve | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Environmental Protection Area | 33 | 101.731 | 189 | 339.260 | 85 | 26.171 | 307 | 467.162 |
| Area of Relevant Ecological Interest | 13 | 341 | 26 | 455 | 9 | 138 | 48 | 934 |
| Permanent Reserve for Natural Heritage | 635 | 4.831 | 209 | 765 | 1 | 0 | 845 | 5.596 |
| **Total Sustainable Use** | **812** | **410.873** | **523** | **607.454** | **100** | **26.480** | **1435** | **1.044.812** |
| **Total** | **959** | **796.503** | **883** | **766.543** | **258** | **27.281** | **2100** | **1.590.327** |
| **Area considering overlap** | **959** | **790.736** | **883** | **760.221** | **258** | **27.243** | **2100** | **1.550.436** |

Source: CNUC/MMA - www.mma.gov.br/cadastro_uc). Atualized in: 10/07/2017.

**32. What activities are undertaken in your country to maintain traditional knowledge of associated biodiversity? Has traditional knowledge of associated biodiversity been used to inform conservation and use decisions in your country? Please share best practices and lessons learned.**

- A measure of impact was the creation of the National Policy for the Sustainable Development of Traditional Peoples and Communities (PNPCT) established in 2007 by Decree No. 6.040. The policy is an action of the Federal Government that seeks to promote the sustainable development of traditional people and communities. This policy emphasizes the recognition, strengthening and securing of their land, and their social, environmental, economic and cultural rights. It further contributes to the respect and value of the identity, forms of organization and institutions of traditional people and communities.

- The actions and activities related to the achievement of the objectives of the National Policy for the Sustainable Development of Traditional Peoples and Communities

occur in an inter-sector and integrated manner. Thus, the responsibility of the National Commission for Sustainable Development of Traditional Peoples and Communities (CNPCT in Portuguese), created by Decree of July 13, 2006, is to coordinate the implementation of this policy.

- The Nacional Commission is composed of fifteen representatives of the agencies and entities of the federal public administration and fifteen representatives of non-governmental organizations. It is chaired by the representative of the Ministry of Social Development and Fight against Hunger (MDS in Portuguese). Among the civil society representatives of CNPCT are the traditional communities of faxinalenses people, people of gypsy culture, indigenous peoples, maroons, peoples related to the collect of mangaba, peoples related to the break of coconut-babassu, traditional marshland communities, fishermen, caiçaras, Pomeranians, Retireiros of araguaia communities and bottom pasture communities.

- Another initiative of great relevance was the recognition by the Institute of National Historical and Artistic Heritage (IPHAN in Portuguese) of the Traditional Agricultural System of the Rio Negro as an Intangible Cultural Heritage of Brazil. The recognition was formalized in December 2010. The construction process of the safeguarding plan for this agricultural system – that has cassava cultivation as a structural element and includes 23 indigenous ethnic groups – considered the practices and principles of traditional populations for conservation of agro-biodiversity.

- A national policy of Agro-ecology, which was built in conjunction with the civil society was launched on August 20, 2013 through Decree No. 7794. Among others aspects, the policy aims the enhancement of agricultural biodiversity and socio-biodiversity products. Furthermore, its objective is to encourage the local experiences of use and conservation of plant and animal genetic resources, especially those that involve the management of local, traditional or landraces breeds and varieties. Moreover, it aims to contribute for reducing gender inequalities through actions and programs that promote the economic empowerment of women.

- Several Brazilian ministries and civil society representatives are committed to the implementation of the National Plan for Organic Production and Agro-ecology which can be found on the website http://www.mda.gov.br/portalmda/sites/default/files/ceazinepdf/cartilhalt_PLANO_NACIONAL_DE_AGR-379811.pdf

- Brazil is not only a biologically diverse country. Few countries can proudly claim to have so many ethnic groups and so many languages inside its borders. There are now more than 230 indigenous peoples with very few members in number. Some of these communities have population of dozens; most of them have hundreds of members, and only a dozen of them have thousands of inhabitants. They speak 180 different languages, and 110 languages of which have fewer than 400 speakers. Of these 230 peoples, more than 210 inhabit the Brazilian Amazon, which correspond to almost half of the 446 recognized indigenous peoples in the entire Amazon basin by various countries that comprise it. (http://raisg.socioambiental.org/node/106).

- This means for a project of technological science policy a huge comparative advantage in biodiversity resources and accumulated knowledge and production.

- This last point has already incorporated in various official documents: traditional knowledge, contrary to what many may think, is not only a repository of knowledge, passed down from one generation to the next. Predominately, and it is that defines them, it is a knowledge that continue to be produced in a specific way; produced by protocols and methods which should not be confused with the hegemonic science. In other words, what characterize traditional knowledge systems are the specific methods and the protocols that they make use. What should be established here is that traditional knowledge systems should not be treated merely as "treasures", a finite legacy of the past, but as open systems of knowledge production that continue to produce important results.

- Therefore, there are two dimensions that must be considered simultaneously in a policy for science, technology and innovation involving traditional knowledge.

- One of them is the contribution that traditional knowledge systems can make to academic science and how to establish synapses, connections between them. When this dialogue and connections are established, there is the possibility of leveraging scientific and technological innovation based on complementation of knowledge. This unique combination improves the chances of innovation, not only in terms of new products, but even in terms of new concepts and models.

- The second dimension, equally important, is to promote the maintenance of these systems, in other words, to give them operating conditions in the present and propel them into the future. For that is being built at the Brazilian Ministry of Science, Technology and Innovation a program that aims to stimulate cross-cultural research in Brazil.

- The Strategic and Participatory Management Secretariat (SGI in Portuguese) of Embrapa created in 2014 a book collection about “Ethnoknowledge”, which aims to build a landmark for survey of traditional peoples and communities and report experiments being undertaken by researchers in different regions of the country.

- A practice that has spread throughout Brazil and is an example of success in the recognition of traditional knowledge for biodiversity conservation is being carried out by Embrapa to recognize indigenous people and local and traditional people and communities as guardians of agrobiodiversity. They are collector-farmers who keep in their communities different seed varieties and are recognized as providers of relevant services for the conservation and distribution of seeds.

- Embrapa has undertaken work in situ conservation of plants (especially fruit trees) native to different Brazilian biomes, identifying best practices for biodiversity conservation. In 2014, the project “Integrating the Conservation and Sustainable Use of Biodiversity in Production Practices with Management of Non-Timber Forest Products and Agroforestry Systems in Forest Landscapes for Multiple Uses High Value Conservation” was approved by the Global Environment Fund (GEF), a project under coordination of Embrapa Genetic Resources and Biotechnology.

- Brazilian legislation on the subject promotes the integration of conservation policies for Brazilian genetic heritage and reduction strategies to combat poverty and the improvement of public health by facilitating the responsible use of biodiversity for

technological development and innovation in the area of biotechnology.

- With the experience garnered from the Use of Genetic Heritage and Benefit Sharing Contracts - CURBs signed in the presence of MP 2.186- No 16/2001, the potential of productive chains that use biodiversity products for poverty reduction and improvement of life quality for local populations have been identified.

- The accumulated experience in projects to strengthen productive chains performed by private entities from the cosmetics sector in different municipalities had as observed results the increase in the average monthly income and the diversification of the income composition of these populations. With increased income from the use of the local biodiversity, there was partial replacement of other potentially harmful activities with great potential for harm to the environment, such as logging in priority areas for conservation.

- In this scenario, the Ministry of the Environment has been engaged in promoting the substitution of predatory activities for activities from economic sectors that use biodiversity in a sustainable way through projects are executed with government and private players.

- One of the goals of these actions is the development of indigenous peoples, traditional communities and family farmers as key links of the productive sectors of the "standing forest". These actions may support the generation of income and the reduction of the pressures on the environment, allied to the appreciation and protection of associated traditional knowledge.

- The appreciation and protection of traditional knowledge occurs through actions that recognize the role of indigenous peoples, traditional communities and family farmers in the management of genetic resources conserved in their territories. This strategy includes, for example, the fostering of community protocols. Community Protocol is a tool recognized by the CBD and the Nagoya protocol in which each community can reaffirm their identity, organization and the rules from their customs of biodiversity management.

Within a traditional and indigenous community, the older the person, there will be less chance of them to be able to read and write. In this way, traditional knowledge has always been maintained by oral tradition, and records existing up to a few years ago have always been made by people outside the community. Nowadays, with the greater tendency of the young people to know how to read and write and have access and easiness in the use of technologies, the registration of this knowledge are being carried out more and more by people from inside the community, which besides having a access much more depth and diverse about each theme subject, give an interpretation / vision to the theme with a bias often different from that given by someone from outside, with a different cultural background.

The recognition and valorization of traditional and indigenous populations, through legislation and public policies, has given greater visibility to them, demystifying some old prejudices and increasing the interest and support to them by the populations from the cities and outside the Country. Among the traditional populations, those with more preserved customs tend to be more valued by society, partly because of the curiosity that the "exotic" can awake in the human being. And with more valued, more strength and access to resources they have. This explains in part the tendency of projects and actions to rescue traditional customs and, with many of them, the valoration and rescue of species associated with these customs.

Unlike what happened until 20 years ago, where the preservation of traditional knowledge was basically done by actions of collecting species samples (part for ex situ conservation), obtaining handicrafts and some records of local customs; today, the number of in situ conservation projects (including the rescue of species lost by communities) and the registration of customs, rites, myths, uses, have been growing a lot.

The demand for traditional species in germplasm banks, maintained for example by Embrapa, has increased in such a way that it is now part of the maintenance dynamics of some species collections to multiply traditional varieties to meet the demands of traditional communities. Among them, corn stands out as one of the most demanded species.

Other actions that have grown a lot in recent years are the promotion of meetings between representatives of different communities and groups of traditional populations and indigenous groups, either in training courses or at seed exchange fairs. In these gatherings, in general, the exchange of knowledge and samples of cultivated species occurs. The importance of the preservation and recovery of traditional knowledge associated with biodiversity species is discussed.

However, with the new legislation, which has increased farmers' rights in relation to their traditional knowledge associated with biodiversity, it has led to an increase in the resistance of access to these species maintained by traditional and indigenous populations, in order to collect for maintain in ex-situ collections. That is, the demand for conserved ex-situ samples in germplasm banks has increased, but at the same time, the volume of collections and entries in germplasm banks of new samples from traditional and indigenous populations has decreased over the same period.

Another action that aims to enhance traditional knowledge was the recognition of intangible cultural assets by the Brazilian Ministry of Culture. There is a strong link between traditional knowledge and associated biodiversity, since many these immaterial goods are, in most cases, related to biodiversity.

**33. Provide any available information on gender dimensions with respect to the maintenance of and knowledge about associated biodiversity. These may include differences in the roles and insights of women and men with respect to maintaining particular resources, monitoring their state, overseeing their management at different stages of production or ecosystem management.**

- A national policy of Agro-ecology, which was built in conjunction with the civil society was launched on August 20, 2013 through Decree No. 7794. Among others aspects, the policy aims the enhancement of agricultural biodiversity and socio-biodiversity products. Furthermore, its objective is to encourage the local experiences of use and conservation of plant and animal genetic resources, especially those that involve the management of local, traditional or landraces breeds and varieties. Moreover, it aims to contribute for reducing gender inequalities through actions and programs that promote the economic empowerment of women.

- Ministry of Environment Ordinance n° 287/2012: establishes the Internal Gender Committee, whose objective is to stimulate reflection for insertion of a gender perspective in environmental policies.

- National Plan for the Promotion of Socio-Biodiversity Product Chains: aims to develop integrated actions for promotion and strengthening of socio-biodiversity product chains, with added value and consolidation of sustainable markets, and to promote and accelerate the overcoming of poverty and social inequalities in rural areas, including gender, race and ethnicity, through a sustainable territorial

development strategy.

- National Plan for Agroecology and Organic Production: aims to articulate and implement programs and actions that lead to the agroecological transition, organic production and agroecological basis, as a contribution to sustainable development, enabling the population to improve the quality of life through the provision and consumption of healthy food and the sustainable use of natural resources. Approaches gender perspective through 3 goals 23 initiatives.

- National Policy Plan for Women: considers the participation of women in the various instances of social control over public policies aimed at social and environmental development; recognizes the role of rural and forest populations that account for the management, distribution, use and conservation of natural resources. It approaches the perspective of gender, biodiversity and sustainable development in 3 of its 10 chapters.

- Decree No. 6,040, of February 7, 2007: establishes the National Policy for the Sustainable Development of Traditional Peoples and Communities, which seeks to promote the sustainable development of Traditional Peoples and Communities, with an emphasis on the recognition, strengthening and guarantee of their territorial, social, environmental, economic and cultural rights, with respect and valorization of its identity, organization forms and institutions. It also targets programs and actions aimed at gender relations in traditional peoples and communities, ensuring the attention and participation of women in government actions, highlighting the historical importance of women and their ethical and social leadership.

- MMA Ordinance No. 287, of August 17, 2012, instituted the internal gender committee to promote the mainstreaming of the gender perspective of environmental policies.

In some regions of Brazil, in general women are more involved in the management and use of biodiversity. This is the case of the "quebradeiras de coco" in the States of Maranhão, Piauí and Tocantins, as the "catadoras de mangaba" in the State of Sergipe (Vieira; Rodrigues, 2009; https://www.embrapa.br/busca-de-publicacoes/-/publicacao/660287/mapa-do-extrativismo-da-mangaba-em-sergipe-ameacas-e-demandas). Probably, the most emblematic example comes from the Quebradeiras de Côco, who are actively involved in the harvesting, transport, processing and commercialization of babassu coconuts. Women lead the main civil society organizations, being very active in ensuring the access to the natural resources, and in the transformation of products for commercialization and family income. The Quebradeiras de Côco Babassu as well as other women groups are active in maintaining and monitoring the resources they need for their family use and income as well for the use of the territories which are fully associated to their livelihoods

***State and trends of wild resources used for food***

**34. Provide in Table 14 a list of wild food species known to be harvested, hunted, captured or gathered for food in your country, and that are not already included in a completed or ongoing Country Report on Forest, Aquatic, Animal or Plant Genetic Resources. Indicate in or around which production system the species is present and harvested, and the change in state of the species over the last 10 years (strongly increasing (2), increasing (1), stable (0),**

**decreasing (-1), or strongly decreasing (-2), or not known (NK)). Indicate where differences within species have been identified and characterized.**

**Table 14.** Wild species used for food in the country.

| Species (local name) | Species (scientific name) | Production systems or other environments in which present and harvested | Change in state (2,1,0,-1,-2, NK) | Differences within species identified and characterized (Y/N) | Source of information |
|---|---|---|---|---|---|
| **Animals** | | | | | |
| Ananaí | *Amazonetta brasiliensis* | NK | NK | NK | NK |
| Capivara | *Hydrochoerus hydrochaeris* | NK | NK | NK | NK |
| Cateto | *Pecari tajacu* | NK | NK | NK | NK |
| Codorna | *Nothura* spp. | NK | NK | NK | NK |
| Cotias | *Dasyprocta* spp. | NK | NK | NK | NK |
| Ema | *Rhea americana* | NK | NK | NK | NK |
| Iguana | *Iguana iguana* | NK | NK | NK | NK |
| Inhambu | *Crypturellus* spp. | NK | NK | NK | NK |
| Jabuti | *Chelonoidis* spp. | NK | NK | NK | NK |
| Jacaré | *Caiman* spp. e *Melanosuchus niger* | NK | NK | NK | NK |
| Jacupemba | *Penelope superciliaris* | NK | NK | NK | NK |
| Jacutinga | *Pipile jacutinga* | NK | NK | NK | NK |
| Macuco | *Tinamous* spp. | NK | NK | NK | NK |
| Marrecos | *Dendrocygna* spp. | NK | NK | NK | NK |
| Mocó | *Kerodon* spp. | NK | NK | NK | NK |
| Muçuã | *Kinosternon scorpioides* | NK | NK | NK | NK |
| Mutum | *Crax fasciolata* | NK | NK | NK | NK |
| Paca | *Cuniculus paca* | NK | NK | NK | NK |
| Paturi | *Netta erythrophthalma* | NK | NK | NK | NK |

| | | | | | |
|---|---|---|---|---|---|
| Perdiz | *Rhynchotus rufescens* | NK | NK | NK | NK |
| Queixada | *Tayassu pecari* | NK | NK | NK | NK |
| Rã-Manteiga | *Leptodactylus ocellatus* | NK | NK | NK | NK |
| Tatus | Dasypodidae | NK | NK | NK | NK |
| Tartarugas | *Podocnemis* spp. e *Kinosternon scorpioides* | NK | NK | NK | NK |
| Teiú | *Tupinambis spp.* | NK | NK | NK | NK |
| Tracajá | *Podocnemis unifilis* | NK | NK | NK | NK |
| Veados | *Mazama spp.* | NK | NK | NK | NK |
| Veado-Campeiro | *Ozotoceros bezoarticus* | NK | NK | NK | NK |
| **Plants** | | | | | |
| Abiu | *Pouteria caimito* | Extractivism | NK | NK | Ministry of Environment. Plants for the Future Initiative Database.<br><br>Vieira, R.F. et al. Espécies Nativas da Flora Brasileira de Valor Econômico Atual ou Potencial – Plantas para o Futuro – Região Centro-Oeste. MMA: 2016.<br><br>Coradin, L. et al. Espécies nativas da flora brasileira de valor econômico atual ou potencial: plantas para o futuro - Região Sul. Brasília: |
| Açaí | *Euterpe oleracea, E. precatoria* | Extractivism and cultivation | 2 | Y | |
| Araticum | *Annona crassiflora* | Extractivism | 1 | Y | |
| Araçá | *Psidium cattleianum; P. guineense* | Extractivism and cultivation | 0 | Y | |
| Araçá-Boi | *Eugenia stipitata* | Extractivism | 1 | NK | |
| Araça-Pêra | *Psidium acutangulum* | Extractivism | NK | NK | |
| Ariá | *Goeppertia allouia* | Extractivism | NK | NK | |
| Aroeira-Pimenteira | *Schinus terebinthifolius* | Extractivism | 2 | NK | |
| Arumbeva | *Opuntia dillenii, O.elata, O. monacantha* | Extractivism | 0 | NK | |
| Babaçu | *Attalea speciosa* | Extractivism | -1 | NK | |
| Bacaba | *Oenocarpus bacaba, O. distichus* | Extractivism | 0 | Y | |

| | | | | | |
|---|---|---|---|---|---|
| Bacuri | *Platonia insignis* | Extractivism and cultivation | 1 | NK | MMA, 2011. |
| Baru | *Dipteryx alata* | Extractivism | 2 | NK | |
| Batata-mairá | *Casimirella rupestris* | Extractivism | NK | NK | |
| Beldroega | *Portulaca oleracea* | Extractivism and cultivation | 1 | NK | |
| Biribá | *Annona mucosa* | Extractivism | 0 | NK | |
| Buriti | *Mauritia flexuosa* | Extractivism | 1 | NK | |
| Butiá | *Butia catarinensis, B. eriospatha* | Extractivism | 1 | Y | |
| Cacau-carambola | *Herrania mariae* | Extractivism | NK | NK | |
| Cacauí | *Theobroma speciosum, T. sylvestre* | Extractivism | 0 | NK | |
| Cagaita | *Eugenia dysenterica* | Extractivism | 1 | NK | |
| Cajá | *Spondias monbim* | | 2 | NK | |
| Cajú-do-Cerrado | *Anacardium corymbosum, A. humile, A. nanum* | Extractivism | 0 | NK | |
| Camu-Camu | *Myrciaria dubia* | Extractivism and cultivation | 2 | NK | |
| Cambui | *Myrciaria floribunda* | Extractivism | 0 | NK | |
| Cará | *Dioscorea altissima*; *D. trifida* | Extractivism and cultivation | 2 | NK | |
| Castanha do Brasil | *Bertholletia excelsa* | Extractivism | 2 | NK | |
| Cereja | *Eugenia involucrata* | Extractivism | 0 | NK | |
| Chichá | *Sterculia striata* | Extractivism | 0 | NK | |
| Chicória-do-pará | *Eryngium foetidum* | Extractivism and cultivation | 1 | NK | |
| Coquinho-Azedo | *Butia capitata* | Extractivism | 1 | Y | |

| | | | | | |
|---|---|---|---|---|---|
| Crem | *Tropaeolum pentaphyllum* | Extractivism and cultivation | 0 | NK | |
| Croá | *Sicana odorifera* | Extractivism and cultivation | 1 | NK | |
| Cubiu | *Solanum sessiliflorum* | Extractivism and cultivation | 2 | NK | |
| Cupuaçu | *Theobroma grandiflorum* | Extractivism and cultivation | 2 | Y | |
| Dendê | *Elaeis oleifera* | Extractivism and cultivation | 1 | Y | |
| Erva Mate | *Ilex paraguariensis* | Extractivism and cultivation | 2 | Y | |
| Fisalis | *Physalis pubescens* | Extractivism and cultivation | 2 | NK | |
| Goiaba-Serrana | *Acca sellowiana* | Extractivism and cultivation | 0 | Y | |
| Guabiroba | *Campomanesia xanthocarpa* | Extractivism | 0 | NK | |
| Guabiroba | *Campomanesia adamantium* | Extractivism | 0 | NK | |
| Gueroba | *Syagrus oleracea* | Extractivism and cultivation | 2 | Y | |
| Inajá | *Maximiliana maripa* | Extractivism | 0 | Y | |
| Jabuticaba | *Plinia cauliflora, P. peruviana* | Extractivism and cultivation | 1 | NK | |
| Jaracatiá | *Jacaratia spinose, Vasconcellea quercifolia* | Extractivism | 0 | NK | |
| Jatobá | *Hymenaea courbaril, H. stigonocarpa* | Extractivism | 1 | NK | |
| Jenipapo | *Genipa americana* | Extractivism | 0 | NK | |
| Juçara | *Euterpe edulis* | | 1 | Y | |
| Jurubeba | *Solanum paniculatum* | Extractivism | 0 | NK | |
| Licuri | *Syagrus coronata* | Extractivism | 0 | NK | |
| Macaúba | *Acrocomia aculeata* | Extractivism and cultivation | 0 | Y | |

| | | | | | |
|---|---|---|---|---|---|
| Major-Gomes | *Talinum paniculatum, T. triangulare* | Extractivism and cultivation | 1 | NK | |
| Mandacaru | *Cereus jamacaru* | Extractivism and cultivation | 0 | NK | |
| Mangaba | *Hancornia speciosa* | Extractivism | 1 | NK | |
| Mangarito | *Xanthosoma riedelianum* | Extractivism and cultivation | 1 | NK | |
| Maracujá | *Passiflora actinia, P. alata, P. cincinnata, P. nitida, P. quadrangularis, P. setacea* | Extractivism and cultivation | 2 | Y | |
| Mini-Pepininho | *Melothria pendula* | Extractivism | NK | NK | |
| Mocambo | *Theobroma bicolor* | Extractivism | NK | NK | |
| Mureré | *Limnocharis flava* | Extractivism | NK | NK | |
| Murici | *Byrsonima crassifolia, B. verbascifolia* | Extractivism and cultivation | 1 | NK | |
| Ora-Pro-Nobis | *Pereskia aculeata* | Extractivism and cultivation | 1 | NK | |
| Pacurina | *Pacourina edulis* | Extractivism | NK | NK | |
| Patauá | *Oenocarpus bataua* | Extractivism | NK | NK | |
| Pequi | *Caryocar brasiliense, C. coryaceum* | Extractivism and cultivation | 2 | Y | |
| Pera-do-Cerrado | *Eugenia klotzschiana* | Extractivism | 0 | NK | |
| Pimenta | *Capsicum* spp. | Extractivism and cultivation | 2 | Y | |
| Pinhão | *Araucaria angustifolia* | Extractivism and cultivation | 1 | Y | |
| Pitanga | *Eugenia uniflora* | Extractivism and cultivation | 2 | Y | |
| Pupunha | *Bactris gasipaes* | Extractivism and cultivation | 1 | Y | |
| Sapota | *Matisia cordata* | Extractivism | NK | | |
| Taioba | *Xanthosoma taioba* | Extractivism and cultivation | 2 | NK | |
| Tucumã | *Astrocaryum* | Extractivism and cultivation | 0 | NK | |

| | | | | | |
|---|---|---|---|---|---|
| | *aculeatum* | | | | |
| Umari | *Poraqueiba sericea* | Extractivism | NK | NK | |
| Umbu | *Spondias tuberosa* | Extractivism and cultivation | 1 | Y | |
| Urucum | *Bixa orellana* | Extractivism and cultivation | 1 | Y | |
| Uvaia | *Eugenia pyriformis* | Extractivism | 0 | NK | |
| Uxi | *Endopleura uchi* | Extractivism | 0 | NK | |
| Vitória-regia | *Victoria amazonica* | Extractivism | NK | NK | |

***Wild food resources at risk***

In this section the objective is to identify uncultivated and wild species used for food within the country that are at significant risk of loss.

**35. List in Table 15 any wild food species for which there is evidence of a significant threat of extinction or of the loss of a number of important populations in your country. Specify the degree of threat according to the classification in use in your country or following the IUCN Red List Categories And Criteria[20]. Include a description of the threat and list references or sources of information if available.**

**Table 15.** Main threats to wild food species identified as at risk.

| Wild food species (scientific name) | Degree of threat | Main threat (indicate) | References or sources of information if available |
|---|---|---|---|
| **Animals** | | | |
| *Nothura minor* | EN | Habitat loss; the direct removal of individuals from nature; agricultural and livestock activities; impact linked to the generation and transmission of energy; urban sprawl | Brazil Red Book of Threatened Species of Fauna (2016)* <br><br> Ministry of Environment, Ordinance 443, December 17, 2014. |
| *Crypturellus noctivagus noctivagus* | VU | | |
| *Crypturellus noctivagus zabele* | VU | | |
| *Penelope superciliaris alagoensis* | CR | | |
| *Kerodon acrobata* | VU | | |
| *Kerodon rupestris* | VU | | |
| *Tayassu pecari* | VU | | |
| *Priodontes maximus* | VU | | |
| *Tolypeutes tricinctus* | EN | | |
| *Mazama bororo* | VU | | |
| *Mazama nana* | VU | | |
| *Ozotoceros bezoarticus bezoarticus* | VU | | |
| *Ozotoceros bezoarticus leucogaster* | VU | | |

[20] IUCN (International Union for Conservation of Nature) (2012). IUCN Red List Categories And Criteria, Version 3.1 Second edition http://jr.iucnredlist.org/documents/redlist_cats_crit_en.pdf

| Plants | | | |
|---|---|---|---|
| *Araucaria angustifolia* | EN | Habitat loss; human disturbance; intrinsic fators; extraction; natural disaster; pollution; invasive species; change in species dynamics | Ministry of Environment, Ordinance 443, December 17, 2014. |
| *Butia eriospatha* | VU | | |
| *Butia capitata* | VU | | |
| *Bertholletia excelsa* | VU | | |
| *Euterpe edulis* | VU | | |

* http://www.icmbio.gov.br/portal/images/stories/comunicacao/publicacoes/publicacoes-diversas/dcom_sumario_executivo_livro_vermelho_ed_2016.pdf

### *Conservation of wild resources used for food*

**36. Are any *ex situ* conservation or management activities or programmes established in your country for wild food species? These may include, for example, culture collections, collections of insects, fungi, etc. If so, list these in Table 16.**

**Table 16.** *Ex situ* conservation or management activities or programmes for wild food species.

| Wild food species conserved (scientific name) | Size of collection (number of accessions) | Conservation conditions | Objective(s) | Characterization and evaluation status |
|---|---|---|---|---|
| *Acrocomia aculeata* | 100 | Field | Conservation<br><br>Research<br><br>Breeding | Genetical diversity, ecology, geographic distribution, molecular analisys |
| *Anacardium* spp. | 588 | Field, green house | | |
| *Ananas* spp. | 624 | Field, in vitro | | |
| *Astrocaryum* spp. | 182 | Field | | |
| *Attalea* spp. | 100 | field | | |
| *Bactris gasipaes* | 435 | Field | | |
| *Bertholletia excelsa* | 10 | Field | | |
| *Bixa orellana* | 15 | Field | | |
| *Byrsonima crassifolia* | 17 | Field | | |
| Cactaceae | 166 | Green house | | |
| *Capsicum* spp. | 2078 | Seeds | | |
| *Caryocar brasiliense* | 15 | Field | | |
| *Dipteryx alata* | 17 | Field | | |
| *Elaeis oleifera* | 239 | Field | | |
| *Euterpe* spp. | 304 | Field | | |
| Fruit trees native to the Mid North Region | 112 | Field | | |
| Native fruit trees of the North Region | 17 | Field | | |
| Native fruit trees of the Southern Region | 76 | Field | | |
| *Genipa americana* | 172 | Field | | |
| *Hancornia speciosa* | 281 | Field | | |
| *Mauritia flexuosa* | 30 | Field | | |
| *Maximiliana maripa* | 63 | Field | | |
| *Myrciaria dubia* | 120 | Field | | |
| *Oenocarpus* spp. | 253 | Field | | |
| *Passiflora* spp. | 418 | Seed, field, green house | | |
| *Piper* spp. | 3021 | Field | | |
| *Platonia insignis* | 172 | Field | | |
| *Psidium* spp. | 160 | Seeds, field | | |

| | | | | |
|---|---|---|---|---|
| *Solanum* wild relatives | 333 | Seeds | | |
| *Spondias* spp. | 133 | Field | | |
| *Theobroma grandiflorum* | 610 | Field | | |
| Unconventional vegetables | 85 | Field | | |

Source: Embrapa Recursos Genéticos e Biotecnologia.

**37. Are any *in situ* conservation and management activities or programmes established in your country that supports maintenance of wild food species? If so list these in Table 17 provide the following information for each activity or program: site name and location, production system(s) involved, conservation objective and specific actions that secure wild food species (if any).**

**Table 17.** *In situ* conservation or management activities or programmes for wild food species.

| **Wild food species conserved (scientific name)** | **Site name and location** | **Size and environment** | **Conservation objective(s)** | **Actions taken** |
|---|---|---|---|---|
| *Caryocar brasiliense* | RDS Nascenters Geraizeiras | 37.200 ha; Cerrado | Conserve biodiversity and environmental services, guarantee area for traditional communities' livelihoods | Control of activities degrading environment, restoration of degraded areas |
| *Annona crassiflora* | RDS Nascenters Geraizeiras | 37.200 ha; Cerrado | Conserve biodiversity and environmental services, guarantee area for traditional communities' livelihoods | Control of activities degrading environment, restoration of degraded areas |
| *Hancornia speciosa* | RDS Nascenters Geraizeiras | 37.200 ha; Cerrado | Conserve biodiversity and environmental services, guarantee area for traditional communities' livelihoods | Control of activities degrading environment, restoration of degraded areas |

**38. What activities are undertaken in your country to maintain traditional knowledge of wild food species (indicate if the extent to which these have already been described in sector reports)? How can traditional knowledge of wild food species be accessed and used to inform conservation and use decisions?**

- Public policies promoting the conservation (eg. SNUC – Sistema Nacional de Unidades de Conservação) and use of biodiversity (PAA, PGPMBio, PNAE) contribute to maintain traditional knowledge, as well as did the PNPPS (Plano Nacional de Promoção das Cadeias de Produtos da Sociobiodiversidade), now extinct. Traditional knowledge can be acessed upon authorization by the CGEN (Conselho de Gestão do Patrimônio Genético), which may or not grant permission to access biodiversity knowledge

**39. Provide any available information on gender dimensions with respect to the maintenance of and knowledge about wild food species. These may include differences in the roles and insights of women and men with respect to harvesting particular resources, monitoring their state, overseeing their ecosystem management.**

- There are no public policies aimed to promote the gender dimensions on the maintenance and knowledge of wild food species. However, by promoting the sustainable use of biodiversity products through public policies (e.g. PAA, PGPMBio, PNAE) wild food species and the knowledge about them is maintained. By harvesting products from the biodiversity, women as well men, work towards the conservation of biodiversity and the lands where the species providing the harvested products occur.

***Natural or human-made disasters and biodiversity for food and agriculture***

This section collects information on natural or human-made disasters and their impact on and response from biodiversity for food and agriculture as a whole.

**40. Has your country experienced any natural or human-made disaster(s) that has had a significant effect on biodiversity for food and agriculture and/or on ecosystem services in the past 10 years? List in Table 18 those for which any information exists on their effect on biodiversity for food and agriculture and/or ecosystem services. Indicate the effect on different components or services as significant increase (2), increase (1), no change (0), some loss (-1), significant loss (–2), or not known (NK).**

**Table 18.** Natural or human-made disasters that has had a significant effect on biodiversity for food and agriculture in the past 10 years in the country.

| Disaster description | Production system(s) affected (code or name) | Effect on overall biodiversity for food and agriculture (2, 1, 0, -1, -2, NK) | Effect on ecosystem services (2, 1, 0, -1, -2, NK) |
|---|---|---|---|
| Inundation | Livestock systems; Naturally regenerated forests; Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems | -1 | -1 |
| Floods | | -1 | -1 |
| Torrents | | NK | NK |
| Soil errosion | | -2 | -2 |
| Landslide | | -1 | -1 |
| Tornadoes | | -1 | -1 |
| Hail | | 0 | 0 |
| Frost | | NK | NK |
| Drought | | -2 | -2 |
| Mass movements | | NK | NK |
| Forest fires | | -2 | -2 |

Surce of information: Brazilian Atlas of Natural Disasters 1991-2012 (https://s2id.mi.gov.br/paginas/atlas).

**41. Briefly summarize any available information, including the year of the disaster, a description of the effects of the disaster on the different components of biodiversity for food and agriculture and/or on the effects on ecosystem services, and references to the supporting documentation.**

Table of number of occurrences of some of the main environmental disasters in Brazil between the years 1991-2012.

| Disaster description | Production system(s) affected (code or name) | Quantitative of diferente disasters |
|---|---|---|
| Inundation and floods | Livestock systems; Naturally regenerated forests; Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems | 4691 |
| Soil errosion | | 349 |
| Tornadoes | | 2757 |
| Hail | | 1638 |
| Frost | | 45 |
| Mass movements | | 699 |

Surce: Brazilian Atlas of Natural Disasters 1991-2012 (https://s2id.mi.gov.br/paginas/atlas).

One of the great threats to Brazilian biodiversity in recent decades has been forest fires. According to data from the Conservation of Nature and Forests Institute (http://www.icnf.pt/portal/florestas/dfci/relat/rel-if/2017), only between 01/01 and 09/30/2017 14,097 occurrences of small, medium and large proportions were recorded in Brazil.

**42. Provide any available evidence from your country that changes in biodiversity for food and agriculture caused by natural or human-made disasters have had an effect on livelihoods, food security and nutrition.**

In Brazil, the main phenomena related to natural disasters are derived from the Earth's external dynamics, such as inundations and floods, sliding of land and / or rocks and storms. These phenomena occur usually associated with intense and prolonged rainfall events, in the rainy periods which correspond to the summer in the south and southeast region and the winter in the northeast region.

Examples of environmental and socioeconomic consequences caused by environmental disasters in Brazil.

| | Environmental consequences | Socioeconomic consequences |
|---|---|---|

| | | |
|---|---|---|
| **Inundation, landslides and floods** | • Biological and chemical contamination of water, food and soil;<br>• Compromise of water supply networks;<br>• Compromise of service network for sewage collection and treatment;<br>• Compromise of waste collection and disposal services;<br>• Change in cycles of vectors, hosts and reservoirs of diseases. | • Interruption of bridges, streets and roads;<br>• Breach of containment dikes;<br>• Breach of fuel tanks;<br>• Interruption of water, electricity, gas, transportation and communication services;<br>• Interruption in operation of schools, commerce, funeral services, health services and others;<br>• Compromise of agricultural and livestock activities<br>• Economic damages due to destruction of property, houses and buildings<br>• Economic damages due to destruction of sources of income and labor |
| **Drought** | • Contamination of water, food and soil;<br>• Compromise of water supply network;<br>• Intrusion of salt water into groundwater freshwater supplies;<br>• Contamination of air by dust and particles from fires and blooms, as well as toxins accumulated in the soil;<br>• Change in the cycles of vectors and hosts of diseases. | • Total or partial interruption of water supply;<br>• Compromise of quantity and quality of water for human consumption;<br>• Compromise of agricultural, livestock and fisheries activities;<br>• Compromise to the quantity and quality of food;<br>• Economic damages due to total or partial destruction of sources of income and labor;<br>• Forced migration. |

Source: Freitas, C.M. Desastres naturais e saúde: uma análise da situação do Brasil. 2014.

**43. Provide any available evidence that the enhanced use of biodiversity for food and agriculture has contributed to improving livelihoods, food security and nutrition in the context of natural or human-made disasters. Describe and provide source of information.**

- Agroforestry and agroecological systems that use biodiversity in their favor have a greater productive diversity and with this they present a greater capacity for recovery after disturbances;

- Reforestation and recovery of degraded areas using native species, which help in the recovery of the soil, prevent the advance of erosion and provide food and shelter for the native fauna;

- Restoration of rivers and streams sources with native forest, contributing to the maintenance of water in quantity and good quality;

- The expansion of the cultivation of native species that are more resistant to pests, deseases and prolonged drought, can guarantee food security for populations living in extreme areas, such as Brazilian Northeast which presents great water restriction.

***Invasive alien species and biodiversity for food and agriculture***

**44. Are there invasive alien species identified in your country that have had a significant effect on biodiversity for food and agriculture in the past 10 years? List in Table 19 those**

**for which any information exists on their effect on biodiversity for food and agriculture and/or ecosystem services. Indicate the effect on different components or services as strong increase (2), increase (1), no effect (0), some loss (-1), significant loss (-2), or not known (NK).**

**Table 19.** Invasive alien species that have had a significant effect on biodiversity for food and agriculture in the past 10 years.

| **Invasive alien species (scientific name)** | **Production system(s) affected (code or name)** | **Effect on components of biodiversity for food and agriculture (2,1,0,-1,-2, NK)** | **Effect on ecosystem services (2,1,0,-1,-2, NK)** |
|---|---|---|---|
| *Phakopsora pachyrhizi* | Livestock grassland-based systems: Tropics | -2 | -1 |
| *Helicoverpa armigera* | Livestock grassland-based systems: Tropics | -1 | -1 |
| *Raoiella indica* Hirst | Irrigated crops (other): Tropics<br><br>Rainfed crops: Tropics | NK | NK |
| *Aethina tumida* | NK | NK | NK |

**45. Briefly summarize any available information related to the invasive alien species listed in Table 19, including a description of the effects of the invasive alien species on the different components of biodiversity for food and agriculture and/or on the effects on ecosystem services, and references to the supporting documentation.**

- The soybean rust *Phakopsora pachyrhizi* is considered a very serious soybean disease in several countries and was firstly detected in Brazil in 2001. Fungicides sprayed against soybean rust, especially early in the growing season, have been causing the suppression of some important invertebrate pathogenic fungi, reducing the intensity of epizootics and the natural control of their targets. Most of the fungicides used against soybean rust are very toxic to the caterpillar-pathogenic fungus *Metarhizium rileyi* and mite-pathogenic fungus *N. floridana*, hindering their action in field crops. Over the years the prevalence of *M. rileyi* epizootics in *Anticarsia gemmatalis* and *Chrisodexis includens* populations in Brazilian soybean fields, for example, has diminished significantly.

- The old world bollworm (*Helicoverpa armigera*) was detected in Brazil in 2013 and probably it was present in Brazil years before its detection, This species is easily confounded with *H. zea*, a common pest of corn native of the Neotropical region. During 2013 and 2014, the occurrence of *H. armigera* triggered an increase of insecticide spraying in cotton and soybean. The economic impact was calculated at US$ 800 millions/year. Beside cotton and soybean, the *H. armigera* attacks were reported in corn, green beans, tomatoes, citrus and pastures. Weeds such as *Rumex* spp. (docks or sorrels, "língua-de-vaca"- portuguese name) and *Conyza bonariensis* (Argentine fleabane, "buva" – portuguese name). The diversity of host-plants may keep *H. armigera* populations elevated around cropped areas but the positive effect of plant diversity level on natural enemies of H. armigera is not known in the Brazilian environment.

- *Raoiella indica* Hirst, the Red Palm Mite (RPM) (Acari, Tenuipalpidae), is a notable and recent example of phytophagous mite that became invasive in the Americas. This mite was found damaging coconut palms on the Caribbean island of Martinique in 2004. Afterwards, RPM was found in other Caribbean Islands, North (USA and Mexico) and South (Venezuela, Colombia) America. In Brazil this invasive mite was first detected in 2009 in the extreme Northern state of Roraima. Regulatory measures failed to prevent the spread of RPM to other Northern State, Amazonas, which occurred two years later. For about five years, the distribution of RPM remained restricted to Northern Brazil. Nevertheless, reports on RPM in São Paulo (Southeastern) and Paraná (Southern) showed that it has spread to other regions of Brazil. After few months (along 2016 and 2017) this invasive mite pest was also detected in other 7 states in Northeastern (Alagoas, Bahia, Pernambuco, Rio Grande do Norte and Sergipe) and 2 in Midwestern Brazil (Distrito Federal, Goiás). Economic, social and environmental impacts are expected following a wider distribution of RPM in Brazil. Significant losses to agriculture may occur due to the potential damage of RPM to plants of economic importance, such as coconut, banana, several species of palm-producing oil, and ornamental plants. Brazil is the third and fourth largest producer of banana and coconut, respectively. Among the host plants infested by the RPM, coconut and bananas seem to be the most threatened. In Trinidad and Tobago, some growers have reported 70% losses to coconut production. There is no data on banana production loss due to RPM attacks; however, in some localities, e.g., Dominican Republic, Trinidad and Tobago and Colombia, this crop has been seriously affected as several basal leaves have completely died and mature leaves have become completely chlorotic. In Brazil, serious damages on both coconut and banana due to RPM infestations have already been observed in some Northeastern states (e.g. Bahia and Ceará), however data on losses are not yet available. Quarantine measures may also lead to economic losses, prohibiting the transportation of propagation material or fresh products of RPM host plants from infested to uninfested areas/countries. Social impacts are expected since many smallholders are engaged in the production or extraction of palm products. Environmental impacts are also possible due to RPM dissemination to native plants that have an important role in the natural ecosystems and/or by alter the diversity and abundance of organisms. In the New World, RPM has not only built large populations and spread quickly, but it also greatly extended its host range, attacking several palm species (Arecaceae) and a number of Cannaceae, Cycadaceae, Heliconiaceae, Musaceae, Pandanaceae, Strelitziaceae and Zingiberaceae species, including exotic and native plants, cultivated or in natural areas. In Brazil native and exotica plants yhat have already reported as being RPM hosts are the palm trees (*Astrocaryum jauari*, *Attalea maripa*, *Bactris gasipaes*, *Bactris maraja*, *Bactris simplicifrons*, *Elaeis guineensis*, *Euterpe oleraceae*, *Euterpe precatoria*, *Mauritia flexuosa*, *Oenocarpus bacaba*, *Oenocarpus bataua*, *Socratea exorrhiza*) and the Heliconiaceae (*Heliconia psittacorum*).

- *Aethina tumida* is an invasive beetle recently recorded in Brazil and it is a great threat to the honeybee in Brazil. Currently, its impacts are negligible, but with A. thumida spreading species in the Brazilian beekeeping, very significant negative impacts are expected.

**46. Has biodiversity for food and agriculture contributed to managing the spread and proliferation or controlling established invasive alien species in your country? If yes, provide information on the invasive alien species involved, the components of biodiversity for food and agriculture and any indication on how the components of biodiversity**

**contributed to managing the spread and proliferation or controlling established invasive alien species in your country. Provide references to the supporting documentation.**

- In 2004, the plant pathogen, '*Candidatus Liberibacter asiaticus*' was detected in Brazil affecting citrus orchaids. The bacteria is a vector-borne plant pathogen, which is transmitted by the Asian citrus psyllid, *Diaphorina citri*. The disease, named greening or huanglongbing, is very destructive. The main control measures adopted in commercial fields include the eradication of disease plants and chemical control of the vector. An eco-friendly way to control the psyllid is the parasitoid *Tamarixia radiata* (of natural occurence in Brazil). The biological agent of control *T. radiate* is not used in commercial fields, due to the parasitoid susceptibility to non selective chemical insecticides, however it has great potential to limit the disease spreed, when employed for controlling the Asian citrus psyllid at sites of HLB outbreaks, adjacent to commercial areas, in abandoned groves, organic groves, areas with orange Jessamine, and backyards.

***Similarities, differences and interactions***

**47. Comment on those aspects with respect to the state, trends and conservation of associated biodiversity or wild food biodiversity in relation to the state, trends and conservation of sector genetic resources. It would be helpful to provide your observations under the following headings:**

a) main similarities between associated biodiversity, wild food diversity and the different sectors;
b) major differences between associated biodiversity, wild food diversity and the different sectors;
c) synergies or trade-offs between associated biodiversity, wild food diversity and the different sectors.

The responses should include relevant information on socio-economic, political and cultural dimensions as well as biological ones. Information on the significance of common characteristics, differences, synergies and trade-offs with respect to achieving food security and nutrition, sustainable production or the provision of ecosystem services should also be provided.

***Gaps and priorities***

**48. With respect to the state, trends and conservation of associated biodiversity and ecosystem services:**

**a) What are the major gaps in information and knowledge?**
**b) What are the main capacity or resources limitations?**
**c) What are the main policy and institutional constraints?**
**d) What actions are required and what would be the priorities?**

- The impacts of changes in land use on ecosystem services; there is limited availability of laboratory technicians to support research on the topic; there are few social scientists to work with natural scientists in solving the problems caused by misuse, misplanning and mismanagement of agricultural lands in the country.

- Exist specific policies, but the institutions are not prepared to inter-disciplinary work, which is a requirement for achieving the desired goals.

- Increase research on the genetic improvement of wild food species aiming greater productivity and greater knowledge of its genetic structure.

- Integration of biodiversity conservation strategies in Protected Areas (PA) with in situ conservation of genetic resources in Genetic Reserves. This strategy seeks to integrate the actions aimed at the conservation of biodiversity, through the PAs, with the conservation of genetic resources, through the implementation in these Protected Areas (PA) of Genetic Reserves (GRs) for species of economic interest or threatened with extinction. Genetic reserves constitute a mode of conservation of genetic resources in situ and also a key factor for the integration of biodiversity conservation policies with that of genetic resources. The integration of Genetic Reserves with the National System of Conservation Units offers the great advantage of ensuring the perpetuity of these Reserves and the permanent in situ conservation of species of current or potential economic value, with emphasis on the wild relatives of the main species of cultivated plants and for landraces. In order to do so, it is necessary to define the priority species, characterize the areas with the greatest genetic variability and map the respective populations for subsequent implantation of the Genetic Reserves, which will show the scientific value of the genetic heritage present in each PA. The results derived from these paths will contribute to guarantee the effectiveness of these areas for the conservation of socio-biodiversity, promotion of sustainable development and reduction of poverty, as well as the awareness of the Brazilian society about the strategic importance of these protected areas.

**49. With respect to the state, trends and conservation of wild resources used for food:**

**a) What are the major gaps in information and knowledge?**

- Considering the great economic potentials of native species, most of them still occupy small and very specific niches, resulting in few species available in the market that can be effectively used in the daily diet of the population.

- Farmers do not have technical assistance or information on the cultivation of native species, much less on the real economic, social and environmental gains resulting from the use of these species.

- Lack of studies to aggregate value and development of differentiated products, to promote the correct use and insertion of these species in the market.

- Carrying out gastronomic events to allow the population to know new foods, new aromas and flavors and, mainly, to incorporate these new flavors into daily food, thus creating new market demands.

- Investment in food processing technologies, which may favor other forms of consumption, more appropriate to the taste of consumers in different regions of Brazil.

- Development of technologies to extend shelf life and facilitate trade, reducing the effect of seasonality of native products on the market.

- Promotion of planting practices, cultural practices and management, aiming to increase fruit production, increase income and social inclusion, without endangering local ecosystems.

- For most native species there are no studies related to domestication or defined production chain. Some species already have minimally established production chains, but everything is still very insipient, which greatly hampers the production and distribution aspects.

- Development of production technologies, post-harvesting and extension services which can assist interested producers.

- Elimination of production bottlenecks, especially those related to the standardization of the raw material.

**b) What are the main capacity or resources limitations?**

- There are few professionals trained to act in the identification of potentials, promotion and use of Brazilian biodiversity, in addition to the low volume of financial resources expended by the Brazilian government to meet the demands of the area.

**c) What are the main policy and institutional constraints?**

- To promote the effective integration between the researchers of the different areas and institutions, and of these with the System of Technical Assistance and Rural Extension, so that the generated knowledge can reach effectively the producers.

- Establish a national schedule of events such as field days, gastronomic fairs, art and craft exhibitions, agricultural fairs, among others. Those are important spaces to demonstrate the current or potential importance of native biodiversity and the relevance of products derived from its components.

- Changes in the curricula of undergraduate courses in agricultural sciences with the inclusion of disciplines focused on the area of conservation, promotion and use of biodiversity.

**d) What actions are required and what would be the priorities?**

- Constant development of new products and forms of marketing.

- Strengthening research groups on the collection, conservation and characterization of germplasm, selection of more productive and resistant genotypes, propagation, cultivation and cultural treatments.

- Research and development actions focused on agronomic aspects are extremely important, and of urgent nature, since most of the native species are still exploited in an extractive way.

**50. With respect to the impact and response to natural or human-made disasters and biodiversity for food and agriculture:**

**a) What are the major gaps in information and knowledge?**
**b) What are the main capacity or resources limitations?**
**c) What are the main policy and institutional constraints?**

**d) What actions are required and what would be the priorities?**

**51. With respect to the impact of invasive alien species on biodiversity for food and agriculture:**

**a) What are the major gaps in information and knowledge?**
**b) What are the main capacity or resources limitations?**
**c) What are the main policy and institutional constraints?**
**d) What actions are required and what would be the priorities?**