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

December, 2017

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TABLE OF CONTENT

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.

- The preparation of this report was coordinated by the Ministry of Agriculture, Livestock and Supply and Ministry of Environment, responsible for the contact and mobilization of the teams in the other national institutions. Researchers were contacted at Embrapa

Genetic Resources and Biotechnology, Ministry of Environment, Ministry of Agriculture, Livestock and Supply and University of Brasilia.

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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.

- **Geographical location**: Brazil (officially the Federative Republic of Brazil) is a country in South America, located between 5˚16'20" North and 33˚45'03" South and between 34˚47'30" and 73˚59'32 West. Brazil is bordered to the north by the Atlantic Ocean, French Guiana, Suriname, Guyana, Venezuela and Colombia; to the south, by Uruguay, Argentina, and Paraguay; to the west, by Peru and Bolivia, and to the east by the Atlantic Ocean, where it has several island groups, the largest being Fernando de Noronha, Abrolhos, and Trindade.

- **Surface area**: With an area of 8,547,403 km^2, Brazil is by far the largest country in the South American continent. Compared to the other nations of the world, only Russia, Canada, the People's Republic of China, and the United States surpass Brazil in terms of territorial size. Linear distances between Brazil's extreme points are considerable, and virtually identical: 4,394.7 km North to South and 4,319.4 km East to West. The Brazilian geographical configuration is such that its borders amount to 23,086 km, of which the Atlantic coastline accounts for 7,367 km. The country's human settlements have historically favoured the coastal area and consequently, the largest part of the land area of Brazil has low population density.
- **Climate:** Brazil occupies land crossed by the Equator and the Tropic of Capricorn and the largest part of the country enjoys tropical climatic conditions. The country possesses a wide climatic diversity in the range of tropical and subtropical climates. This is due to a number of factors, such as geographic position, altitude, relief and the dynamics of air masses. The air masses that most impact the Brazilian climate are: Equatorial (Continental and Atlantic), Tropical (Continental and Atlantic) and Atlantic Polar. According to Koeppen's Climate Classification**,** predominant climate types in Brazil are, by region: North - tropical wet (Am, Aw, Aw' and Af); Northeast – tropical dry (Bsw e Bswh'); Central West - tropical wet and dry (Aw); Southeast – temperate mild dry (Cwa and Cwb); and South – temperate mild subtropical (Cfa, Cfb).
- **Brazilian Biomes**: Brazil is privileged in the extent of its continuous lands, a great part of which is appropriate for cultivation. The country has abundant water resources (the largest fresh water reserves on the planet, 8% of the world volume), as well as different biomes, which place it among the countries with greatest biodiversity on Earth. Of the estimated 250 thousand species of higher plants in the world, about 32 thousand are native to Brazil. Although the division by biomes is most relevant to production systems, it is important to point out that Brazil is divided into five physiographic regions: the North, Northeast, Central West, Southeast and South, each one of which usually encompasses more than one biome. Figure 1 illustrates the localization of biomes, as well as the five geographic regions discussed in the report. The diversity of species in the Brazilian flora is due to the edapho-climatic peculiarities that influence the vegetation types in the six different biomes: Amazon, Cerrado, Caatinga, Atlantic Forest, Pampa (Southern fields) and Pantanal, as described below**.** There is one additional biome, called the Coastal and maritime zone, which has little relevance for this document but has great ecological and economic impact and contains activities such as shrimp farming and sea fishing, which are based on animal genetic resources.

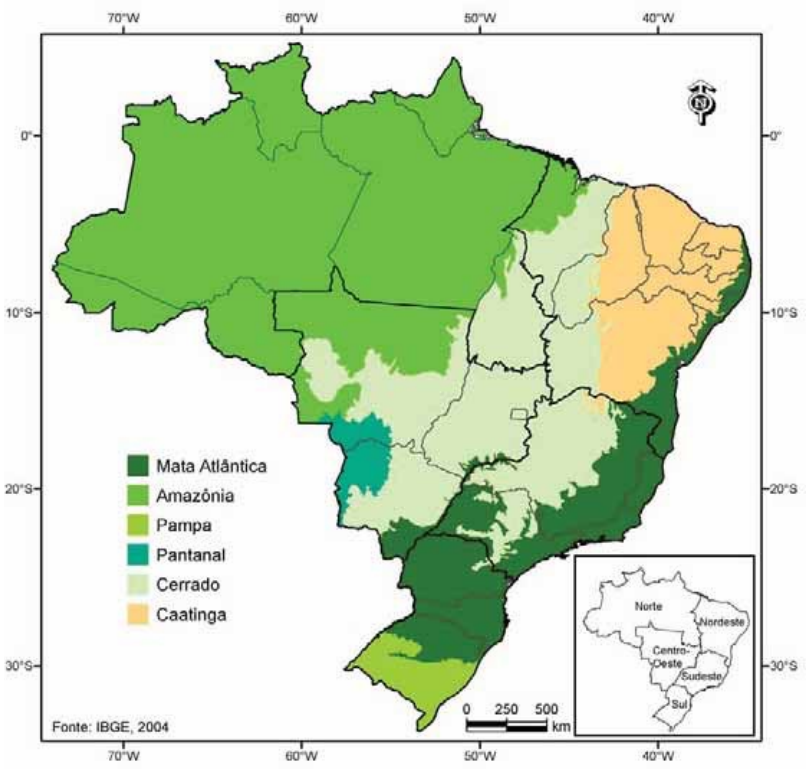

Figure 1. Brazilian biomes. Source: Sérgio Noronha (Embrapa).

- **Population data, urban and rural populations**: According to the Brazilian Federal Constitution, from October 5, 1988, the Federal Republic of Brazil consists of the Union, the Federal District, States and Counties (Municípios), which all are autonomous entities. The Federal District is the seat of the Federal Government, with its three branches of power: Executive, Legislative, and Judicial. Brazil has 26 states and 5,507 counties. In 2017, the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística – IBGE) estimated the Brazilian population at 208.2 million people. In recent years, there has been considerable migration to large urban centres, so that today about 76% of the country's population lives in cities and only 24% in rural areas.
- **Agricultural sector: international market**: Over the last three decades, the explosive growth in Brazilian agricultural production is unmatched by any other country. Productivity and quality of crops also reached, and in some cases surpassed, those of other top food producing nations in the world. Besides macroeconomic, sector and technological policies, agribusiness organization is a crucial factor in this success. Brazilian grain production increased 33% between the 2005/2006 and 2010/2011 harvests, from 122.5 million tonnes to 163.0 million tonnes. During this period, the planted area increased 4.3%, while the average yield increased from 2.6 tonnes per hectare to 3.3 tonnes per hectare (+27.5%). In fact, the productivity gains achieved in recent years were the main reason for the record harvest of 2010/2011. Brazil is one of the world leaders in the production and export of several agricultural products. It is the biggest producer and exporter of coffee, sugar and orange juice. Moreover, Brazil leads the ranking of exports of soybean, beef, chicken, tobacco, leather and leather shoes (Figure 2). Projections indicate that very soon the country will also be the largest world

cotton and biofuels producer, the latter of which is made from sugarcane and vegetable oils. Corn, rice, fresh fruit, cocoa, nuts, as well as swine and fish are also prominent in Brazilian agribusiness, which currently employs over 17.7 million field workers alone. These data show that the country is strongly competitive on the international market and emphasizes the importance of agriculture for the national economy. National grain production was estimated at 227,5 million tons for the 2017/18 harvest, 58% increase on the 2007/2008 harvest. Of this total, 96.8% are from the summer harvest, and 3.2% from the winter harvest. This increase was due to good climatic conditions and to more technology-intensive practices. The area cultivated with grain was approximately 61 million hectares for the 2017/2018 harvest (Figure 3).

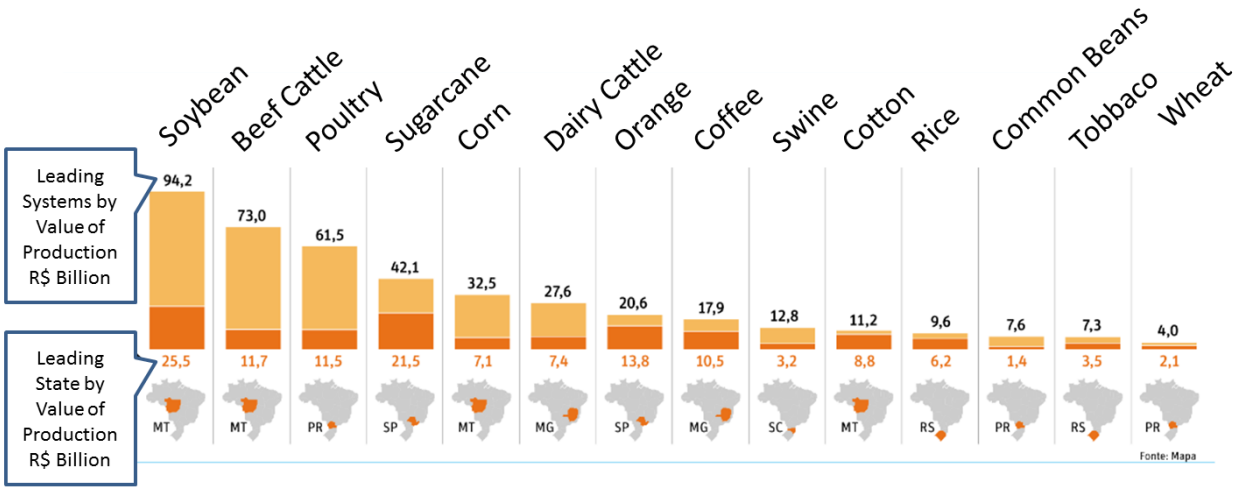

Figure 2. Agricultural diversity in Brazil. Source: MAPA/CONAB.

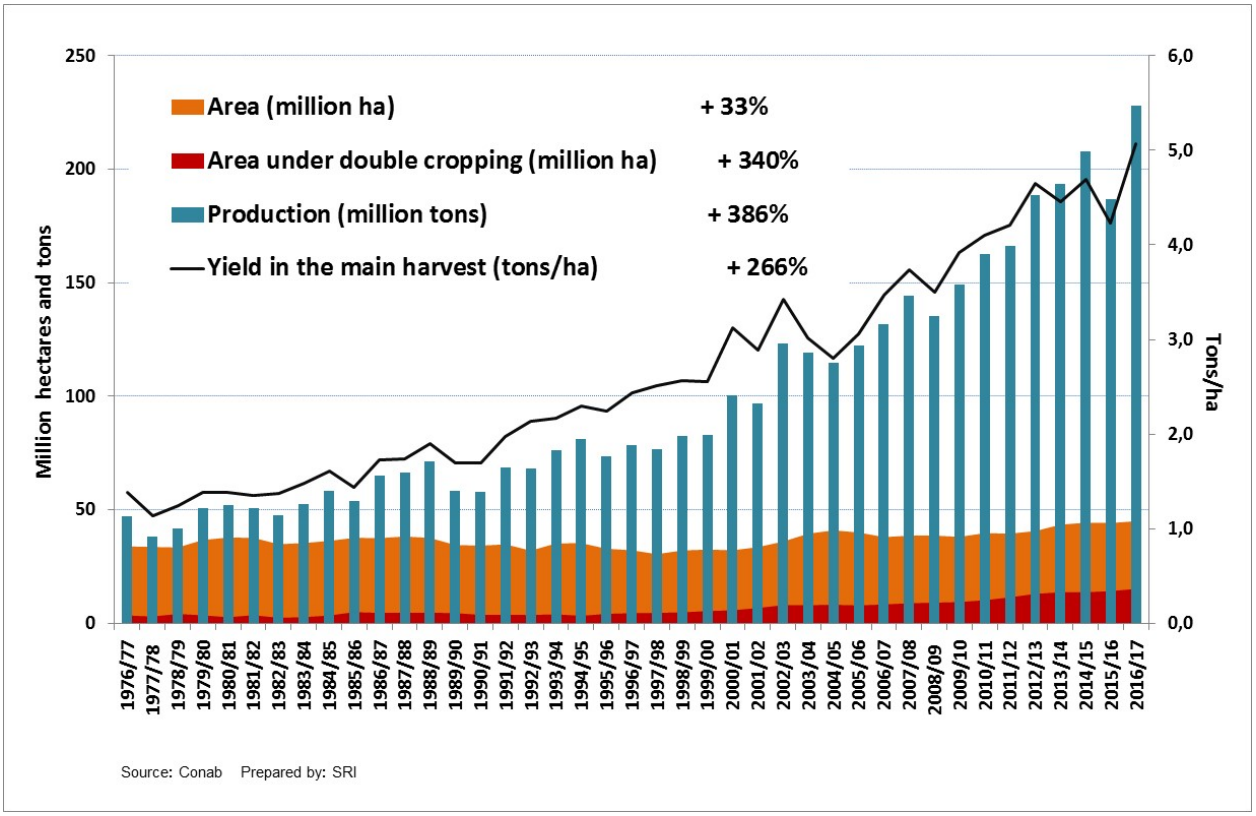

Figure 3. Grain production, land use and yield (1976/2017). Source: MAPA/CONAB.

- 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. 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. 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.

- 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 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.

- Agricultural sector is responsible for a quarter of Brazilian GDP, producing food and commodities. 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.

- 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, 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.

- Brazil created the National Agricultural Research System (*Sistema Nacional de Pesquisa Agropecuária* - SNPA) comprising Embrapa, State Agricultural Research Organizations (*Organizações Estaduais de Pesquisa Agropecuária* - Oepas), universities, and national or state research institutes, in addition to other public and private organizations directly or indirectly linked to agricultural research activities. The current form of the system was instituted in 1992 by Ordinance no. 193 (August 7, 1992) of the Ministry of Agriculture and authorized by the Agricultural Law (Law no. 8,171, January 17, 1991). With regard

to ex situ conservation, SNPA has 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 expansion of urban areas over conservation areas; not observing good agricultural practices. The illegal deforestation, especially in Amazonian areas; 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; 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

[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.

	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[10]	M1	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	Y
	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.

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

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	Continuous grazing system with brachiaria pasture, average of 1 U.A./ha (Animal Unit). Mineral supplementation and urea. Average gains of 300 to 500g/animal /day. Production units of 1000 ha on average. The zebu breeds predominate, like Nelore, Guzerá and Gir. Average milk production from 1000 to 1700L/cow/year.
L2	Livestock grassland-based systems: Subtropics	Continuous or rotational grazing system in pasture of *Brachiaria* or *Panicum*. Mineral supplementation with urea, in some cases supplementation with concentrate, 0.1 to 0.5% of body weight/animal/day. There may be bulky supplementation in the dry period with elephantgrass (*Pennisetum purpureum*) or sugar cane (*Saccharum officinarum*). Gains ranging from 500 to 800g/animal/day. Production units ranging from 200 to 1000 there on average. Predominant zebu breeds such as Nelore, Gir and Guzerá and mestizos of these breeds with Angus, Dutch and Jersey. Capacity ranging from 1 to 5 U.A./ha, depending on the region. Average milk production from 1700 to 2500L/cow/year.
L3	Livestock grassland-based systems: Temperate	Continuous or rotational grazing systems with temperate grasses of the genus *Cynodon* or millet in summer and temperate grasses such as oats and ryegrass in winter. Predominant bullfighting races such as Angus, Hereford, Dutch and Jersey. More intensive use of concentrated supplementation, up to 1% of live weight/animal/day. Average gains from 500 to 1000g/animal/day. The number of animals can range from 50 to 200/ha. In some regions it is possible to find large properties with native pasture, in the case of *Trifolium* spp., where the production system is more extensive.
L5	Livestock landless	Large confinements averaging 10,000 to 50,000 head. Zebu genetics, mainly Nellore and its crosses. Bulk feed based on corn silage or sugar

[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.

	systems: Tropics	cane and concentrate based on soybean bran and corn or sorghum and cottonseed bran. In some cases, local co-products such as babassu pie or palm pie are used, but on a low scale. Daily average gains of 1500g/animal/day. Mean confinement time from 90 to 120 days.
L6	Livestock landless systems: Subtropics	The region has large confinements, up to 10,000 animals, mainly in the states of Goiás, Mato Grosso and Mato Grosso do Sul, but also presents medium and small confinements, under 5000 animals. It is characterized by the great availability of agroindustrial grains and co-products used in the composition of feed. Genetics is predominantly Nelore, with increase in the percentage of Nelore crosses with Angus. Feed based on corn silage or sorghum or sugar cane and agroindustrial co-products (derived from the preserved vegetable industry and brewery waste). In milk production some properties exist that confine animals of the Dutch breed with high productivity indexes, up to 25.000L / ha. Confinement in the production of milk made in free-stall sheds or in pickets and, more recently, in the form of Compound. Usually they are large estates, with herds above 500 lactating cows.
L7	Livestock landless systems: Temperate	Characterized by small family properties and small confinements (less than 1000 animals). Breeding taurine breeds, mainly Angus and Hareford. Food based on corn silage, sorghum and millet. Concentrated feed based on soybeans, corn, sorghum, millet or wheat. Average gains from 1500 to 1700g/animal/day. In milk production, the feedlots are made in "free stall" or "composted" sheds, with a productivity of 15.000L/ha. Smaller herds, ranging from 200 to 500 lactating cows. Quality of milk superior to other regions of Brazil. Taurine genetics, mainly the Dutch and Jersey breed and their crosses. High milk production, up to 5000L/cow/year.
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 (Figure 4)
F2	Naturally regenerated forests: Subtropics	
F3	Naturally regenerated forests: Temperate	The Pampa is one of the most significant temperate forest formations in Southern Brazil (Figure 5). 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	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

	fisheries: Tropics and subtropics	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 (Figure 6).
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	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).

	and fisheries): Tropics	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 management of pests and diseases and traffic control. (Crop-Livestock-Forest Integration), meeting the basic premises of the No-Tillage System.
M2	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics	
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.

Note: A summary of national agricultural production is presented in Figure 7.

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

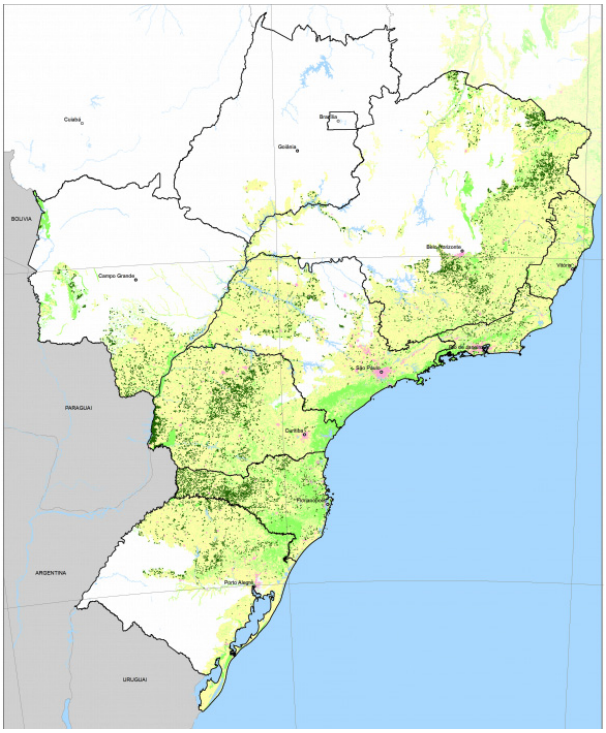

Fig 4. Naturally regenerated forests: Temperate. Source: Secretariat of Environment and Sustainable Development of Rio Grande do Sul, 2017 (https://www.sosma.org.br/projeto/atlas-da-mata-atlantica/dados-mais-recentes/atlas-da-regeneracao).

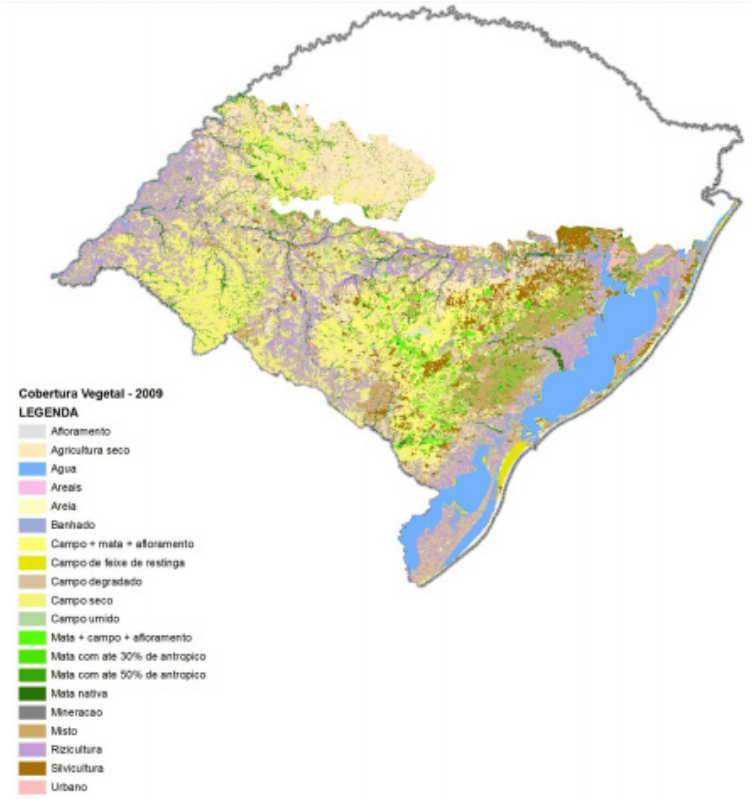

Figure 5. Map of the forest regeneration of the Atlantic Forest between 1985/2015. Source: SOS Mata Atlantica (https://www.sosma.org.br/projeto/atlas-da-mata-atlantica/dados-mais-recentes/atlas-da-regeneracao).

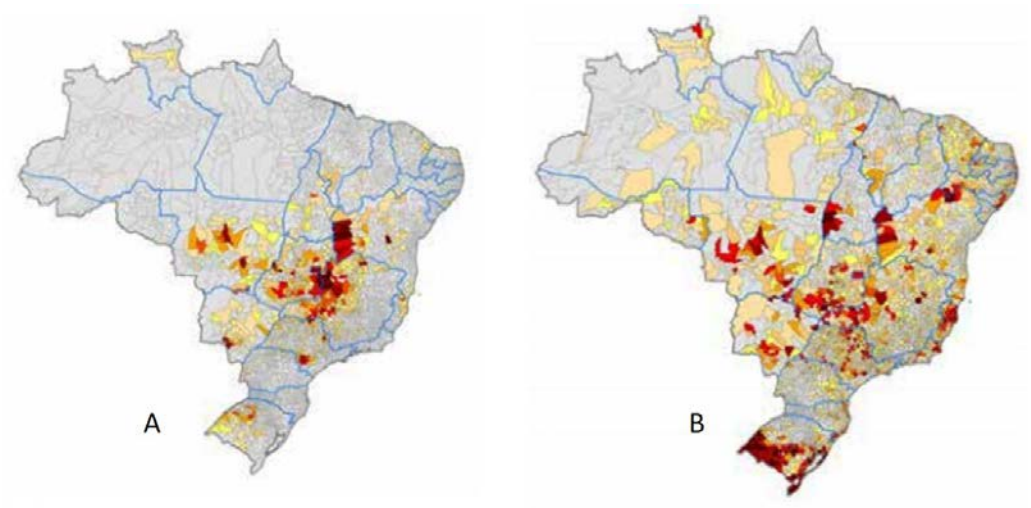

Figure 6. Irrigated crops (other): Tropics. A) Pivot; B) Other systems. The darker the colors, the higher the concentration of irrigated crops in the systems mentioned. Source: National Water Agency (ANA) (http://arquivos.ana.gov.br/imprensa/arquivos/ProjetoPivos.pdf).

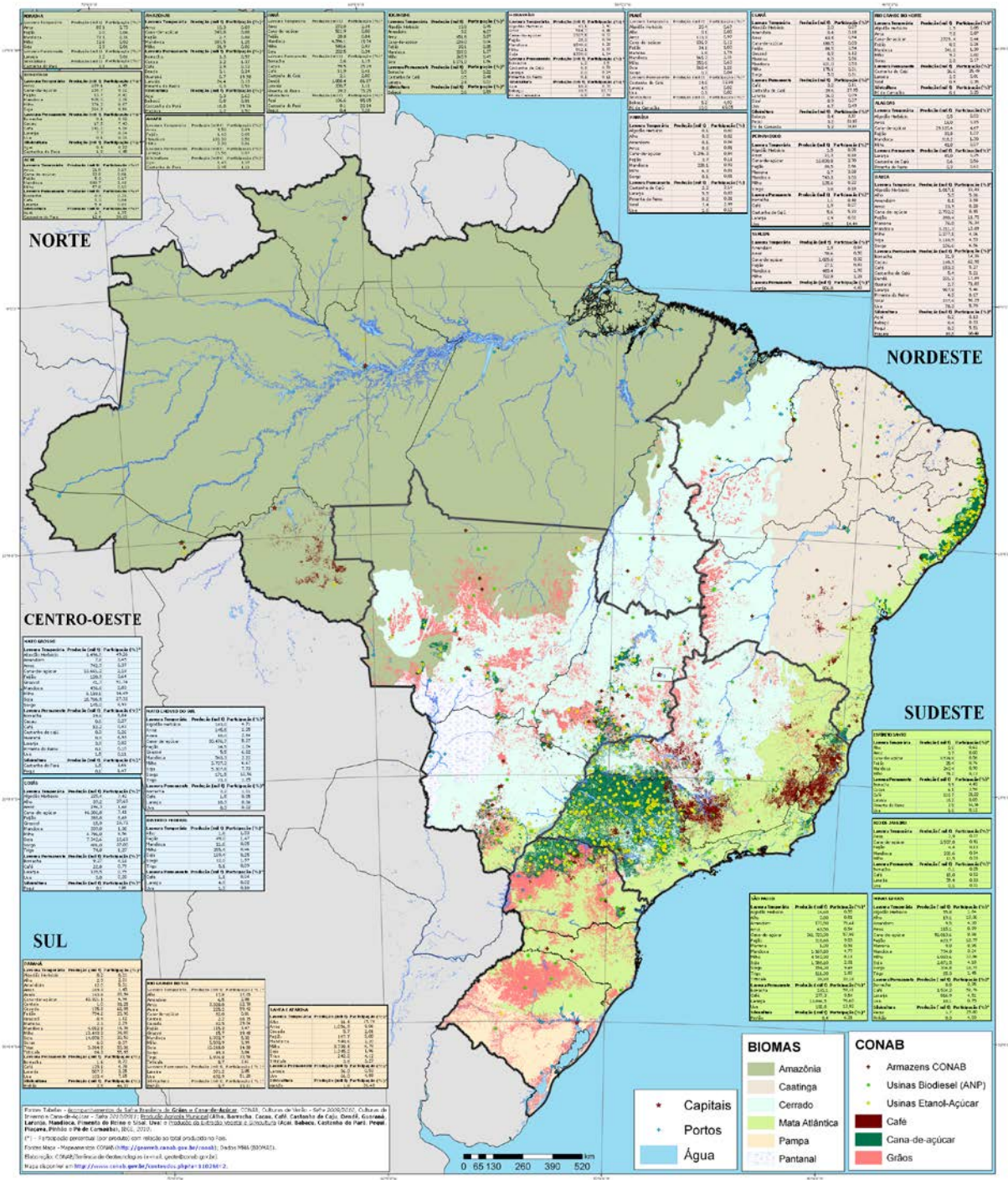

Figure 7. General map of agricultural production in Brazil, according to data from Companhia Nacional de Abastecimento (CONAB), by the year 2010 (http://www.conab.gov.br/OlalaCMS/uploads/arquivos/12_02_09_11_57_02_slide1.png).

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	NK	NK	NK	NK
L2	Livestock grassland-based systems: Subtropics	NK	NK	NK	NK
L3	Livestock grassland-based systems: Temperate	NK	NK	NK	NK
L5	Livestock landless systems: Tropics	NK	NK	NK	NK
L6	Livestock landless systems: Subtropics	NK	NK	NK	NK
L7	Livestock landless systems: Temperate	NK	NK	NK	NK
F1	Naturally regenerated forests: Tropics	NK	NK	NK	NK
F2	Naturally regenerated forests: Subtropics	NK	NK	NK	NK
F3	Naturally regenerated forests: Temperate	NK	NK	NK	NK
F5	Planted forests: Tropics	NK	NK	NK	NK
F6	Planted forests: Subtropics	NK	NK	NK	NK
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 (ha)	9,6 million tons	NK	2016
C2	Irrigated crops (rice): Subtropics				
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	NK	NK	NK	NK
M2	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics	NK	NK	NK	NK
O1	Mixed forests				
O2	Organic systems	0,75 million (ha)	NK	NK	2017
O3	Extractive systems	234 thousand farmers	$ 405 million	NK	2017

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

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.

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.

- Changes in land and water use and management: Brazil is one of the world´s leading food producers, having achieved a 70% increase in agricultural production between 2000 and 2012, considering the increase in productivity and the opening of new areas. 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; Illegal deforestation and opening of agricultural areas may threat Brazilian biomes.

- Pests, diseases, alien invasive species: Exotic and invasive species, both in the terrestrial and in the aquatic environment;

- Climate change and emission of air pollutants;

- Population growth and urbanization: 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;

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

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

- Pollution and external inputs: 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 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 caused 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 is already higher than its water sources in 1,133 of its municipalities, which shelter 20 million 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	NK	NK	NK	NK
	Pollution and external inputs	NK	NK	NK	NK
	Over-exploitation and overharvesting	NK	NK	NK	NK
	Climate change	NK	NK	NK	NK
	Natural disasters	NK	NK	NK	NK
	Pests, diseases, alien invasive species	NK	NK	NK	NK
	Markets, trade and the private sector	NK	NK	NK	NK
	Policies	NK	NK	NK	NK
	Population growth and urbanization	NK	NK	NK	NK
	Changing economic, socio-political, and cultural factors	NK	NK	NK	NK
	Advancements and innovations in science and technology	NK	NK	NK	NK
Forests	Changes in land and water use and management	NK	NK	NK	NK

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

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

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

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

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

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

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

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

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

	Pollution and external inputs	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Over-exploitation and overharvesting	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Climate change	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Natural disasters	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Pests, diseases, alien invasive species	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Markets, trade and the private sector	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Policies	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Population growth and urbanization	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changing economic, socio-political, and cultural factors	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Advancements and innovations in science and technology	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Other	NK	NK	NK	NK	NK	NK	NK	NK	NK

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

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.

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	NK	NK	NK
Pollution and external inputs	NK	NK	NK
Over-exploitation and overharvesting	NK	NK	NK
Climate change	NK	NK	NK
Natural disasters	NK	NK	NK
Pests, diseases, alien invasive species	NK	NK	NK
Changing markets	NK	NK	NK
Policies	NK	NK	NK
Population growth and urbanization	NK	NK	NK

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

Changing economic, socio-political, and cultural factors	NK	NK	NK
Advancements and innovations in science and technology	NK	NK	NK
Other [*please specify*]			

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

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.

- Population growth and urbanization: com a urbanização e uma maior demanda de alimentos nas cidades, as espécies vegetais não comerciais cairam em desuso.

- Changing economic, socio-political, and cultural factors: mudança de habitos alimentares das gerações mais novos privilegiando alimentos industrializados aos naturais.

- Advancements and innovations in science and technology: avanço do melhoramento genético vegetal e animal, representado pelo aumento da produtividade e renda reduziu a utilização de material genético não melhorado.

- Pests, diseases, alien invasive species: 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.

- Changes in land and water use and management (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.

- Pollution and external inputs (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 and external inputs: Treated and untreated domestic sewage is still a source of water pollution, particularly in urban areas, together with the flow from agriculture, this sewage may contribute to the load of organic matter in Brazilian water bodies.

- Changes in land and water use and management affect availability, diversity and knowledge of wild foods. The land use change caused by illegal deforestation aimed to convert land for agriculture, cattle ranching and silviculture may reduce the areas with wild foods. On the other hand, if safeguards of land use close to waterbodies defined on Brazilian environmental legislation is not followed, land use changes may affect the water.

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

In answering questions 16 to 18, 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 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 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?

For a few decades now, 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. Somes policies underway:

- National Plan for Promotion of Socio-Biodiversity Productive Chains, 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;

- National Policy for Sustainable Development of Traditional Peoples and Communities (PNPCT): 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.

- Knowledge and cultural diversity meetings: aiming to create means of protection, valorization and promotion of traditional knowledge. Various initiatives to promote and disseminate traditional knowledge and practices has been carrying out. An example is 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: several regional events that promote the encounter between traditional peoples and communities to exchange knowledge and experiences have been supported. 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, 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.

18. Which drivers have had the most significant effect on the role of biodiversity for food and agriculture in improving food security and sustainability?

The main driver nowadays that has the most significante effect on the role of biodiversity for food and agriculture is federal policies. Somes exemples of policies underway:

- National Network of Plant Genetic Resources: implemented 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): 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.

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

- Changing economic, socio-political, and cultural factors:
  - 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.
- Changing markets:
  - 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) aimed at promoting the sustainable use of biodiversity in agroecological production.

- 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 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: 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

[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.

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 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 result it is possible to make an evaluation of the dynamics of the 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.

- 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) 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).

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

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

- Amal: 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: effort to evaluate the conservation state of Brazilian plant species (http://cncflora.jbrj.gov.br/portal).

Regarding the conservation of agrobiodiversity, instituitions that composes SNPA, 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	NK	NK	NK	NK

Livestock grassland-based systems: Subtropics	NK	NK	NK	NK
Livestock grassland-based systems: Temperate	NK	NK	NK	NK
Livestock landless systems: Tropics	NK	NK	NK	NK
Livestock landless systems: Subtropics	NK	NK	NK	NK
Livestock landless systems: Temperate	NK	NK	NK	NK
Naturally regenerated forests: Tropics	NK	NK	NK	NK
Naturally regenerated forests: Subtropics	NK	NK	NK	NK
Naturally regenerated forests: Temperate	NK	NK	NK	NK
Planted forests: Tropics	NK	NK	NK	NK
Planted forests: Subtropics	NK	NK	NK	NK
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	NK	NK	NK	NK
Irrigated crops (rice): Subtropics	NK	NK	NK	NK
Irrigated crops (other): Tropics	NK	NK	NK	NK
Irrigated crops (other): Subtropics	NK	NK	NK	NK
Rainfed crops: Tropics	NK	NK	NK	NK
Rainfed crops: Subtropics	NK	NK	NK	NK
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	NK	NK	NK	NK
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics	NK	NK	NK	NK
Mixed forests	NK	NK	NK	NK
Organic systems	NK	NK	NK	NK
Extractive systems	NK	NK	NK	NK

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

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	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Livestock grassland-based systems: Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Livestock grassland-based systems: Temperate	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Livestock landless systems: Tropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Livestock landless systems: Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Livestock landless systems: Temperate	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Naturally regenerated forests: Tropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Naturally regenerated forests: Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Naturally regenerated forests: Temperate	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Planted forests: Tropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Planted forests: Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
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	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Irrigated crops (rice): Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Irrigated crops (other): Tropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Irrigated crops (other): Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Rainfed crops: Tropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Rainfed crops: Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Mixed forests	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Organic systems	NK	NK	NK	NK	NK	NK	NK	NK	NK	
Extractive systems	NK	NK	NK	NK	NK	NK	NK	NK	NK	

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

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	NK	NK
	Changes in crop genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in forest genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

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;*	Naturally regenerated	Y	Pollinators Project Pires et al. (2016),

	Epicharis flava; Eulaema; Melipona quadrifasciata nigrita; Melipona scutellaris; Nannotrigona testaceicornis; Tetragonisca angustula; Trigona spinipes; Xylocopa frontalis; Xylocopa grisescens	forests: Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems		Viana (2015)
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 Naturally regenerated forests: Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems	Y	Saito, M.L. Plantas praguicidas. 2004.
Pest and disease regulation (microrganisms)*	*Metarhizium anisopliae* s.s. (target pest – cercopids)	Livestock grassland-based systems: Tropics 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 Extractive systems		Agrofit (2017); Faria & Wraight (2007); van Lenteren et al. (2017)
	Trichoderma spp. (target disease – soil-borne fungal pathogens)	Rainfed crops: Tropics Organic systems Extractive systems	NK	Agrofit (2017); Bettiol (2011); Bettiol et al. (2012)
	Trichogramma spp. (target pest – lepidopterans)	Rainfed crops: Tropics 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	Rainfed crops:	NK	Moscardi & Sósa-

	(target pest – *Anticarsia gemmatalis*)	Tropics		Gomez (2000); 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 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. (native and exotic isolates) (target disease- aerial and soil-borne plant pathogens)	Rainfed crops: Tropics Organic systems 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 Organic systems 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*) 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*) Obs: origin not detemined, probably an American species, endemic or naturalized in Brazil occurring on cultivated and	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)

	wild host plants.			
	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 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. *Pistia stratiotes*	Aquaculture and fisheries 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 Naturally regenerated forests: 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 Naturally regenerated forests: Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems	Y	
Soil formation and protection; nutrient cycling; water cycling;	*Avena* spp.; *Cajanus cajan*; *Canavalia ensiformis*; *Cicer arietinum*; *Crotalaria* spp.; *Dolichos lablab*; *Glycine*	Livestock systems Naturally regenerated	Y	Ministry of Agriculture, Livestock and Supply. Bancos

habitat provisioning; production of oxygen/ gas regulation	*max*; *Helianthus annuus*; *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*	forests: Planted forests; Irrigated crops; Rainfed crops; Mixed systems; Mixed forests; Organic systems; Extractive systems		comunitários de 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*; *Eugenia* spp.; *Opuntia*	Livestock systems Naturally regenerated forests: Planted forests; Aquaculture and fisheries Irrigated crops; Rainfed crops;	Y	Ministry of Environment. Plants for the Future Initiative Database. Vieira, R.F. et al. Espécies Nativas da Flora Brasileira de Valor

	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.;	Mixed systems; Mixed forests; Organic systems; Extractive systems		Econômico Atual ou Potencial – Plantas para o Futuro – Região Centro-Oeste. MMA: 2016. Coradin, L. et al. Espécies nativas da flora brasileira de valor econômico atual ou potencial: plantas para o futuro - Região Sul. Brasília: MMA, 2011.

Note: The information presented on the table above does not represent the totality of the information related to associated biodiversity species actively managed in Brazil, but only the information that was readily available.

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.

- Agrofit 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. Portal for services and management of data and information on Genetic Resources in Brazil. Contains passport data, statistics, characterization and evaluation of materials kept in germplasm banks. (http://alelobag.cenargen.embrapa.br/AleloConsultas/Conservacao/capacidade.do).

- 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).

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) **<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)* Ordinance 444 and 445 of December 17. 2014
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		

* 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.

[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

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 Ministry of Environment Ordinance 443 of December 17. 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.

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.

With the creation of Embrapa Genetic Resources and Biotechnology and the consolidation of the Agricultural Research Cooperative System (Sistema Cooperativo de Pesquisa Agropecuária - SCPA), today named National Agricultural Research System (Sistema Nacional de Pesquisa Agropecuária - SNPA), an environment was put in place that favours the establishment of a national genetic resources network. This was instrumental in organizing and improving the efficiency of the following activities: germplasm collection, exchange and quarantine, characterization, evaluation, documentation, and more importantly, conservation and utilization. SNPA is partially made up of EMBRAPA, with its 41 research units, and similar corporations maintained by most Brazilian states, as well as other federal and state level agricultural research institutions, universities and publicly or privately owned companies directly or indirectly involved in agricultural research. Most initiatives aimed at the conservation of plant, animal and microorganism germplasm available in Brazil have recently been integrated under one umbrella, the Cooperative Platform for Genetic Resources, which includes EMBRAPA and many associated institutions.

With the participation of all these different institutions, the National Network currently maintains 383 Active Plant Germplasm Banks (AGBs), of which 140 are within the Embrapa system and 243 are at other SNPA institutions. The distribution by State of Brazilian GABs (Figura 8) that work in conjunction with Embrapa Genetic Resources and Biotechnology is depicted in Figure 5. Of these AGBs, 52% conserve only exotic species, while 32% conserve native species alone and the remaining 16% conserve both categories of species. The high proportion of exotic species in these AGBs is indicative of their importance for food and agriculture in Brazil.

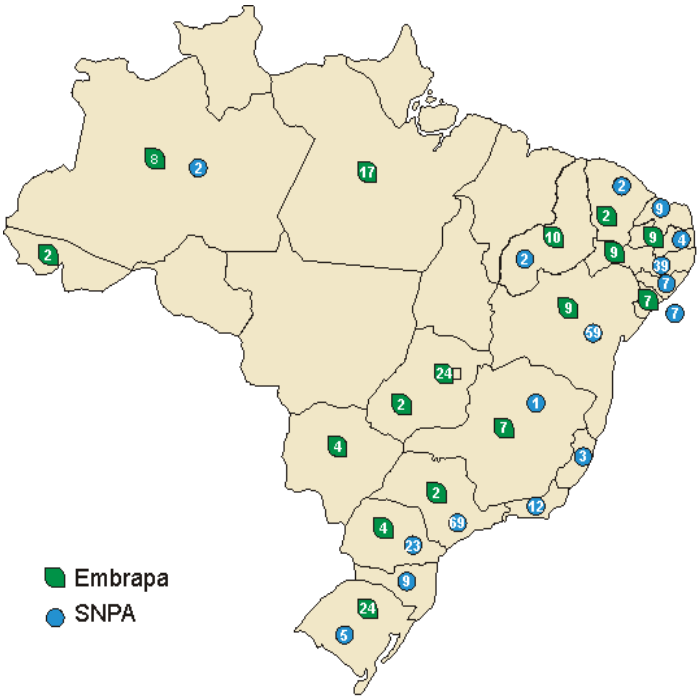

Figure 8. Distribution of Active Germplasm Banks by Brazilian States. Source: Embrapa.

The largest and most significant ex situ conservation work in Brazil is led by Embrapa. 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.

- Anothers institutions 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).

- Others institutions that holds relevant ex situ conservation activities: Comissão Executiva do Plano da Lavoura Cacaueira (CEPLAC/CEPEC); Empresa Baiana de Desenvolvimento Agrícola (EBDA); Empresa Estadual de Pesquisa Agropecuária da Paraíba (EMEPA); Empresa Pernambucana de Pesquisa Agropecuária (IPA); Empresa de Pesquisa Agropecuária e Extensão Rural de Santa Catarina (EPAGRI); Fundação Estadual de Pesquisa Agropecária do Rio Grande do Sul (FEPAGRO); Instituto Agronômico de Campinas (IAC); Instituto de Botânica de São Paulo (IBOT); Instituto Agronômico do Paraná (IAPAR); Instituto Nacional de Pesquisa da Amazônia (INPA); Universidade Estadual de Campinas (UNICAMP); Universidade Estadual de Feira de Santana (UEFS); Universidade Estadual do Norte Fluminense (UENF); Universidade Estadual de Santa Cruz (UESC); Universidade Federal de Alagoas (UFAL); Universidade Federal da Bahia (UFBA); Universidade Federal do Ceará (UFC); Universidade Federal do Piauí (UFPI); Universidade Federal do Recôncavo Baiano (UFRB); Universidade Federal de Sergipe (UFSE); Universidade Federal Rural de Pernambuco (UFRPE); Universidade Federal Rural do Semi-Árido (UFERSA).

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,	

Watermelon	369	seeds	research, breeding	
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,	

Passion fruit (*Passiflora* spp.)	418	seed, field, green house	breeding	
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		

Ornamental trees of importance to the Northeast Region	145	green house	conservation, research, breeding	
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				
Asinine	151	Purified DNA	conservation, research and breeding	Phenotypic and genetic characterization of germplasm; evaluation of productive potential; ecology; reproductive
Bubaline	638	Purified DNA		
Caprine	1221	Purified DNA		
Equine	794	Purified DNA		
Milk cattle	3013	Purified DNA		
Beef cattle	226	Purified DNA		
Galliforme	188	Purified DNA		

Ovine	4519	Purified DNA		strategies (fishes); genetical diversity
Freshwater fish	158	Purified DNA		
Marine fish	123	Purified DNA		
Chelonians	273	Purified DNA		
Swine	606	Purified DNA		
Asinine	5	Sperm		
Caprine	48	Sperm		
Equine	12	Sperm		
Beef cattle	141	Sperm		
Ovine	65	Sperm		
Swine	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	<u>Preserved unit:</u> 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. In the bacteria conservation can be used vegetative cells or spores, in the case of the sporulants. <u>Conditions:</u> cryopreservation,	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	cooling, dehydration.		
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	NK	NK	NK	NK	NK
Invertebrates	NK	NK	NK	NK	NK
Vertebrates	NK	NK	NK	NK	NK
Plants	NK	NK	NK	NK	NK

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

In situ conservation in Brazil is carried out through a network of protected areas (named "Conservation Units" by Federal Law n. 9,985/2000) 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.

In Brasil, there is a number of activities, projects and programs related to *in situ* conservation, inside and outsite protected areas, but the complete information is not readily available.

Table 13. Consolidated table of protected areas (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. Updated on: 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. 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 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. 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.

- In 2014 was created 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 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.

- Brazil has undertaken work in situ conservation of plants (especially fruit trees) native to different 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).

- 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, Brazil 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 is being carried out more and more by people from inside the community, which besides having an 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 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 official recognition of intangible cultural assets. 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 other 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.

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. 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. 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. Coradin, L. et al. Espécies nativas da flora brasileira de valor econômico atual ou potencial: plantas para o futuro - Região
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	0	NK	
Bacaba	*Oenocarpus bacaba, O. distichus*	Extractivism	1	Y	
Bacuri	*Platonia insignis*	Extractivism and cultivation	1	NK	
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	1	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	NK	NK	Sul. Brasília: MMA, 2011.
Cagaita	*Eugenia dysenterica*	Extractivism	1	NK	
Cajá	*Spondias monbim*		2	NK	
Cajú-do-Cerrado	*A. humile, A. nanum*	Extractivism	1	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	0	Y	
Erva Mate	*Ilex paraguariensis*	Extractivism and cultivation	2	Y	
Fisalis	*Physalis pubescens*	Extractivism and cultivation	0	NK	
Goiaba-Serrana	*Acca sellowiana*	Extractivism and cultivation	1	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	2	NK	
Jaracatiá	*Jacaratia spinosa, Vasconcellea quercifolia*	Extractivism	0	NK	
Jatobá	*Hymenaea courbaril, H. stigonocarpa*	Extractivism	1	NK	
Jenipapo	*Genipa americana*	Extractivism	1	NK	
Juçara	*Euterpe edulis*	Extractivism and cultivation	1	Y	
Jurubeba	*Solanum scuticum*	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	*P. alata, P. cincinnata, 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 aculeatum*	Extractivism and cultivation	1	NK	
Umari	*Poraqueiba sericea*	Extractivism	NK	NK	
Umbu	*Spondias tuberosa*	Extractivism and cultivation	1	Y	
Urucum	*Bixa orellana*	Extractivism and cultivation	2	Y	
Uvaia	*Eugenia pyriformis*	Extractivism	0	NK	
Uxi	*Endopleura uchi*	Extractivism	0	NK	
Vitória-regia	*Victoria amazonica*	Extractivism	NK	NK	

Note 1: For the attribution of the notes, the following criteria were considered in each category: 2 (production from cultivation and extractivism, consumed in the regional and national markets, widespread use among the population with different products in the market); 1 (production from extractivism or domestic crops, regional trade and consumption, widespread use in the region of origin with some products available in the regional market); 0 (exclusively extractive production, restricted local consumption) an NK (not known).

Note 2: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

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)[*] 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		
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

[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

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 Research 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 Genetic Resources and Biotechnology.

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	NK	NK
Floods		NK	NK
Torrents		NK	NK
Soil errosion		NK	NK
Landslide		NK	NK
Tornadoes		NK	NK
Hail		NK	NK
Frost		NK	NK
Drought		NK	NK
Mass movements		NK	NK
Forest fires		NK	NK

Surce of information: Brazilian Atlas of Natural Disasters 1991-2012 (https://s2id.mi.gov.br/paginas/atlas).
Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

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	Quantitative of

	(code or name)	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; • Compromise of water supply networks; • Compromise of service network for sewage collection and treatment; • Compromise of waste collection and disposal services; • Change in cycles of vectors, hosts and reservoirs of diseases.	• Interruption of bridges, streets and roads; • Breach of containment dikes; • Breach of fuel tanks; • Interruption of water, electricity, gas, transportation and communication services; • Interruption in operation of schools, commerce, funeral services, health services and others; • Compromise of agricultural and livestock activities • Economic damages due to destruction of property, houses and buildings • Economic damages due to destruction of sources of income and labor

Drought	• Contamination of water, food and soil; • Compromise of water supply network; • Intrusion of salt water into groundwater freshwater supplies; • Contamination of air by dust and particles from fires and blooms, as well as toxins accumulated in the soil; • Change in the cycles of vectors and hosts of diseases.	• Total or partial interruption of water supply; • Compromise of quantity and quality of water for human consumption; • Compromise of agricultural, livestock and fisheries activities; • Compromise to the quantity and quality of food; • Economic damages due to total or partial destruction of sources of income and labor; • 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)**
NK	NK	NK	NK
NK	NK	NK	NK
NK	NK	NK	NK

NK	NK	NK	NK

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

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.

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.

- The Brazilian Official List of invasive allien species is under construction. One example of component of biodiversity that has contributed to manage plant pests is the parasitoid Tamarixia radiata (of natural occurence in Brazil) 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 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?

- Effect of natural disasters on the health of human communities and the environment;

- Correct identification of signs to avoid environmental disasters or to minimize their effects;

- Definition of strategies for the creation of continued public policies that especially target the most vulnerable populations;

- Studies to elucidate the links between the main factors that result in environmental disasters in Brazil: social processes that result in precarious living conditions and make certain population groups (eg the elderly, women and children) more vulnerable to disasters; and climate change resulting from environmental degradation.

b) What are the main capacity or resources limitations?

- There are few professionals trained to act in the identification of potential risks, in addition to the low volume of financial resources expended to meet the demands of the area.

c) What are the main policy and institutional constraints?

- Lack of integrated and continuous long-term policies for tackling drought and drought, as well as investments in environmental education actions and programs aimed at disaster prevention, especially floods in densely urbanized areas.

- Absence of effective urbanization plans, which limit irregular occupations in areas at risk.

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

- Effect of natural disasters on the health of human communities and the environment: Over the last 20 years in Brazil, some 96 million people have been exposed to environmental disasters, especially the economically most vulnerable populations. It is possible that the same population was affected by the same kind of disaster over the years. The experience of repeated disasters, with their environmental, socioeconomic and health consequences, contributes to an overlapping of health risks that have not yet been fully studied. Considering that the risks and effects on health are diverse and will be expressed at different moments in the lives of these populations, surveillance actions are structured, not only for the short term, in the immediate post-disaster period, but also involving medium and long-term actions integrated with health care actions, could reveal a number of still hidden health impacts.

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?**

CHAPTER 4: The state of use of biodiversity for food and agriculture

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

The questions in this chapter seek to obtain information on:

- The contribution of biodiversity for food and agriculture to:
  - production (or provisioning ecosystem services) and especially to food security and nutrition and to rural poverty reduction;
  - supporting and regulating ecosystem services;
  - sustainability and resilience;
- The application of an ecosystem approach;
- The state of the sustainable use of biodiversity for food and agriculture.

Since the sectoral State of the World reports already presented or in preparation provide information separately on the use of animal, aquatic, forest and plant genetic resources, the responses here should provide available information on:

- The combined use of genetic resources coming from different sectors;
- Synergies between genetic resources of the different sectors
- The use of all types of associated biodiversity, either as separate components or in combination;
- The use of wild foods and, where information exists, other important wild harvested products.

The uses of biodiversity for food and agriculture can include:

- The direct use of genetic resources from different sectors or of associated biodiversity and wild foods, individually or in combination;
- The indirect use through the provision of supporting and regulating ecosystem services;
- The support for land/water restoration or other land/water management objectives;
- The support of cultural ecosystem services including:
  - Use for cultural, amenity or social reasons;
  - Use in education or scientific research.

To help reporting and provide a common framework for analysis of Country Reports a set of biodiversity maintaining management practices and diversity based practices have been identified in Annex 5 and Annex 6. These provide a framework for a number of the questions in this Chapter.

The information provided for this Chapter should also cover the adoption of an ecosystem approach. One such approach has been developed under the Convention on Biological Diversity and comprises 12 principles[21].

A final section of this Chapter of the Country Report should address the sustainable use of different components of biodiversity for food and agriculture, wild foods and other wild harvested products.

Where information is available, comment on the different roles played by men and women in the use of genetic resources, use and consumption of wild foods and knowledge over local ecosystems.

The use of management practices or actions that favor or involve the use of biodiversity for food and agriculture

This section looks for information on the extent to which biodiversity maintaining management practices and diversity based practices are in use in your country.

Considerations on questions 52 and 53: These questions were not answered because of the complexity of the requested data. Although some information is available to the Brazilian Institute of Geography and Statistics (IBGE) and the National Supply Company (CONAB) and other federal government agencies, these are available in the form of raw data, which would depend on months of analysis of tables and graphs to arrive at an answer that is as close as possible to reality, and that, even so, would already be out of date, since the last agricultural recapture of Brazil dates from 2006. However, in the year 2017 the Brazilian Institute of Geography and Statistics (IBGE) is preparing the new Agricultural Census in the country. Data collection will be done in more than 5.3 million agricultural establishments throughout the country and will support the implementation of the National System of Agricultural Research, which will allow the creation of the National Survey by Sample of Agricultural Establishments. The research will allow to capture detailed data on income and expenses in production, credit and rural insurance, use of irrigation, protection of springs, conservation of fauna and flora, use of agrochemicals, production techniques, besides the social and family situation of the workers of the field (https://censos.ibge.gov.br/agro/2017). These data will be available from the second semester of 2018, when the country will then be able to respond more reliably and accurately to these issues.

52. For each of the production systems present in your country (indicated in Table 1) indicate in Table 20 the extent of use of management practices that are considered to favor the maintenance and use of biodiversity for food and agriculture.

A full description of the production practices listed is given in Annex 5 and the table below should be completed separately for each production system.

In each table indicate the percent of total production area or quantity under the practice (where known), changes that have occurred over the last 10 years in the production area or quantity under the practice (significant increase (2), some increase (1), no change (0), some decrease (-1), significant decrease (-2), not known (NK), not applicable (NA)), and any identified change in biodiversity for food and agriculture associated with the practice

[21] http://www.cbd.int/ecosystem/principles.shtml

(strongly increasing (2) increasing (1), stable (0) decreasing (-1), strongly decreasing (-2), not known (NK), not applicable (NA)).

Table 20. Management practices that are considered to favor the maintenance and use of biodiversity for food and agriculture

Production system Livestock grassland-based systems: Tropics [L1]			
Management practices[22]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK, NA)**
Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
Integrated Pest Management (IPM)	NK	NK	NK
Pollination management	NK	NK	NK
Landscape management	NK	NK	NK
Sustainable soil management practices	NK	NK	NK
Conservation agriculture	NK	NK	NK
Water management practices, water harvesting	NK	NK	NK
Agroforestry	NK	NK	NK
Organic agriculture	NK	NK	NK
Low external input agriculture	NK	NK	NK
Home gardens	NK	NK	NK
Areas designated by virtue of production features and approaches	NK	NK	NK
Ecosystem approach to capture fisheries	NK	NK	NK
Conservation hatcheries	NK	NK	NK
Reduced-impact logging	NK	NK	NK
Others (describe)	NK	NK	NK
	NK	NK	NK

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

Provide or cite references to any documentary evidence that exists to support the evaluation given above. Indicate where practices used in a production system are affecting biodiversity for food and agriculture in another production system.

Where evidence exists of an effect of any of these practices on biodiversity for food and agriculture, provide a brief summary of the effect, the components of biodiversity for food and agriculture affected, and available indicators. Include any available references or reports.

53. For each of the production systems present in your country (indicated in Table 1) indicate in Table 21 the extent of use of diversity based practices that involve the use of biodiversity for food and agriculture.

[22] Detailed descriptions of management practices that are considered to favor the maintenance and use of biodiversity for food and agriculture can be found in Annex 5.

A definition of the diversity based practices listed is provided in Annex 6; the table below should be completed separately for each production system.

In each table indicate the percent of total production area or quantity under the practice (where known), changes in the production area or quantity under the practice that have occurred over the last 10 years (strongly increasing (2), increasing (1), stable (0) decreasing (-1), strongly decreasing (-2), not known (NK)) and any identified change in biodiversity for food and agriculture associated with the diversity based practice (strongly increasing (2) increasing (1), stable (0) decreasing (-1), strongly decreasing (-2), not known (NK)).

Table 21. Diversity based practices that involve the enhanced use of biodiversity for food and agriculture

Livestock grassland-based systems: Tropics [L1]			
Diversity based practices [23]	**Percent of production area or quantity under the practice (%)**	**Change in production area or quantity under the practice (2,1,0,-1,-2, NK, NA)**	**Effect on biodiversity for food and agriculture (2,1,0,-1,-2, NK)**
Diversification	NK	NK	NK
Base broadening	NK	NK	NK
Domestication	NK	NK	NK
Maintenance or conservation of landscape complexity	NK	NK	NK
Restoration practices	NK	NK	NK
Management of micro-organisms	NK	NK	NK
Polyculture/Aquaponics	NK	NK	NK
Swidden and shifting cultivation agriculture	NK	NK	NK
Enriched forests	NK	NK	NK
Others [*please specify*]	NK	NK	NK

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

Briefly summarize the information that exists on the effect of the diversity based practice on different components of biodiversity for food and agriculture. Indicate where practices used in a production system are affecting biodiversity for food and agriculture in another production system. Include any available references or reports to support the evaluation given above.

54. List and briefly describe any specific programmes or projects that have been undertaken in the country to support any of the practices listed in Table 20 and Table 21. Provide information where available on what types of activities were supported, areas and numbers of farmers, pastoralists, forest dwellers and fisher folk involved, state and outcome with respect to components of biodiversity for food and agriculture.

- Programa ABC (Low Carbon Agriculture Program) – Actions to be taken to adopt the sustainable production technologies selected to meet the commitments to reduce greenhouse

[23] Detailed descriptions of diversity based interventions can be found in Annex 6.

gas emissions.The Sectoral Plan for Mitigation and Adaptation to Climate Change for the Consolidation of a Low Carbon Economy Economy - ABC is one of the sectoral plans elaborated in accordance with article 3 of Decree No. 7,390 /2010 and the organization and planning of the actions to be taken to adopt the sustainable production technologies selected to meet GHG emission reduction commitments 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 Livestock-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.

- The scope of the ABC Plan is national and its period of validity is from 2010 to 2020, and revisions and updates are planned in regular periods not exceeding two years ago, to re-adjust it to the demands of society, new technologies and incorporate new actions and goals, if necessary.
- To reach the objectives outlined by the ABC Plan, in the period between 2011 and 2020, it is estimated that resources of the order of R$ 197 billion will be required, financed with budgetary sources or through credit lines.
- The ABC Plan should be understood as the instrument for integrating the actions of governments (federal, state and municipal), the productive sector and civil society, to reduce emissions of greenhouse gases (GHG) from agricultural, forestry activities and livestock. For its effectiveness an institutional arrangement will be established that involves the representations of the various entities involved. The participation of civil society is essential and reaffirms the democratic character in the design and implementation of the programs envisaged.
- The ABC Plan has a credit line - ABC Program - approved by BACEN Resolution No. 3.896 of 08/17/10.

Sustainable use of biodiversity for food and agriculture

Sustainable use of biodiversity for food and agriculture ensures its utilization in ways that do not compromise its continuing availability and its use by future generations. Sector reports will provide information on sustainable use of the different sector genetic resources. Here the focus is therefore on associated biodiversity and on wild foods.

55. What are the major practices in your country that negatively impact associated biodiversity and/or wild foods? Answers can be provided in Table 22 where examples of general types of practices are listed.

Table 22. Major practices that negatively impact associated biodiversity and/or wild foods in the country.

Types of practices	Major practice (Y/N)	Description	Reference
Over-use of artificial fertilizers or external			

inputs			
Over-use of chemical control mechanisms (e.g. disease control agents, pesticides, herbicides, veterinary drugs, etc.)			
Inappropriate water management			
Practices leading to soil and water degradation			
Over-grazing			
Uncontrolled forest clearing			
Fishing in protected areas			
Overharvesting			
Others [*please specify*]			

[*Insert rows as needed*]

Please comment on the reasons why the practices are in use and discuss if trade-offs are involved.

56. Briefly describe any actions and countermeasures taken to limit unsustainable use and/or support sustainable use of associated biodiversity and/or wild foods.

- The National Plan for the Promotion of Sociobiodiversity Production Chains (PNPPS) seeks to promote the sustainable use of biodiversity and ensure generation of alternative incomes for rural communities through access to credit, technical assistance and rural extension, markets and trade instruments and guaranteeing a minimum price.

- Demarcation of Extractivist Reserves (RESEX) as territorial spaces destined for the agrosustainable development and conservation of renewable natural resources by extractivist populations.

- Demarcation of Sustainable Development Reserves (RDS), which are natural areas that shelter traditional populations, whose existence is based on sustainable systems of exploitation of natural resources, developed over generations and adapted to local ecological conditions and which play a fundamental role in protecting the nature and the maintenance of biological diversity.

- Initiative Plants for the Future, which aims to identify native species of native flora of Brazil of current or potential economic use. This initiative has already listed more than 70 species directly used in food by rural and urban communities in the various regions of Brazil. The Initiative also considers the species used as medicine, fiber, oils, animal feed, meats and energy, among others, which are not used directly for human consumption but are part of agricultural production and linked to the food and nutritional security of the population.

- Good Practices in Sustainable Management: a series of instructional guides aimed at rural communities and family farmers, to guide the sustainable collection and integral use of fruits, fibers and honey. Information for various native fruits of the Cerrado and the Caatinga is already available, such as pequi (*Caryocar brasiliensis*) and mangaba

(*Hancornia speciosa*). (http://www.ispn.org.br/categoria/editais-e-documentos/publicacoes/).

57. Provide in Table 23 any information available that lack of biodiversity for food and agriculture is limiting food security and nutrition, and/or rural livelihoods in the different production systems in your country. Indicate the production systems affected together with any information on the extent of problem (significant lack (2), some lack (1)), describe the effects on livelihood, food security and nutrition, and the components of biodiversity for food and agriculture that are limited. The list of components of biodiversity for food and agriculture given in Annex 1 should be used where possible.

Table 23. Effect of the lack of biodiversity for food and agriculture on production, food security and nutrition and livelihood.

Production system	**Biodiversity component for which diversity is lacking[24]**	**Extent of problem (2,1)**	**Effect on food security and nutrition**	**Effect on livelihood**	**Reference**
Livestock grassland-based systems	NK	NK	NK	NK	NK
Livestock landless systems	NK	NK	NK	NK	NK
Naturally regenerated forests	NK	NK	NK	NK	NK
Planted forests	NK	NK	NK	NK	NK
Self-recruiting capture fisheries	NK	NK	NK	NK	NK
Culture-based fisheries	NK	NK	NK	NK	NK
Fed aquaculture	NK	NK	NK	NK	NK
Non-fed aquaculture	NK	NK	NK	NK	NK
Irrigated crops (rice)	NK	NK	NK	NK	NK
Irrigated crops (other)	NK	NK	NK	NK	NK
Rainfed crops	NK	NK	NK	NK	NK
Mixed systems (livestock, crop, forest and /or aquatic and fisheries)	NK	NK	NK	NK	NK
Mixed forests	NK	NK	NK	NK	NK
Organic systems	NK	NK	NK	NK	NK
Extractive systems	NK	NK	NK	NK	NK

[24] Please refer to list in Annex 1.

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

The contribution of biodiversity for food and agriculture to improving productivity, food security and nutrition, livelihoods, ecosystem services, sustainability, resilience and sustainable intensification

This section looks for information on the direct contributions of biodiversity for food and agriculture to improving productivity, food security and nutrition, livelihoods, ecosystem services, sustainability, resilience and sustainable intensification. It is concerned specifically with the combined use of genetic resources coming from different sectors, the use of all types of associated biodiversity, the use of wild foods and, where information exists, other important wild products.

Note the ways in which biodiversity for food and agriculture contributes to food security and nutrition, livelihoods, ecosystem services, sustainability, resilience and sustainable intensification are often linked. Answers to the requests for information below may therefore be combined.

58. Where available, provide information that increasing the amount of biodiversity for food and agriculture, including associated biodiversity, in production systems in your country have improved the following:

a) **Productivity:** In the last three decades the cultivation of oil palm (*Elaeis guineensis*) in Brazil was practically unviable by a disease known as Budd root. However, studies on native biodiversity revealed a native oil palm species from Amazonia, caiaué (*Elaeis oleifera*), which once hybridized with *E. guineensis*, resulted in individuals tolerant to budd root. These hybrids currently form the basis of commercial palm oil crops in Brazil. According to data from Embrapa, the productive potential of the crops is 5-7 t/ha with the new cultivars tolerant to the diseases.

b) **Food security and nutrition:** Rescue of native unconventional vegetables and reinsertion of these species in rural and urban feeding. Unconventional vegetables are species present in some regions that influence the feeding of populations, especially in rural areas. The recovery and appreciation of traditional varieties of vegetables represents important gains from a cultural, economic, social and nutritional point of view. The cultivation of these vegetables is done by traditional populations and small family farmers, who preserve the knowledge about their cultivation and consumption, passing from generation to generation. In addition, it provides options for the diversification of agricultural crops, as well as rich and diversified nutrient sources for the populations, especially in the poorer regions.

c) **Rural livelihoods:** An important means of ensuring the subsistence of rural families is forest restoration. Tropical forest restoration projects help restore degraded, damaged, or destroyed ecosystems, and bring economic benefits to landowners. Forest restoration is an efficient way to increase food production and improve livelihoods, as well as a way to provide an economic return to landowners. Restored tropical forests can potentially help increase crop yields as they harbor pollinators of these crops and natural enemies of pests.

d) **Ecosystem services:** The conservation of biodiversity and the sustainable use of its components, not only of each species for their intrinsic value, but also of their interactions and diverse roles in ecosystems, which result in ecosystem services that are essential for the maintenance of life on Earth. Land as well as to directly or indirectly sustain all economic activities. Loss of biodiversity, and / or changes in the composition of ecosystem biodiversity, inevitably results in some degree of impact on ecosystem balance and service delivery.

e) **Sustainability:** The vast majority of species native to Brazilian biodiversity are exploited in an extractive way, which may compromise the sustainability of the activity in the short term. One way of minimizing the effects of this activity on natural populations is the genetic improvement of native species with potentials of economic use in the short term. Recently, it has been introduced two passion fruit cultivars resulting from the selection of wild materials from the Cerrado and Caatinga biomes. In 2015 the cultivar of maracuja Pérola do Cerrado, developed from the species Passiflora setacea, native of Cerrado and with productive potential of 25 tons / ha / year. In 2016 the cultivar BRS Sertão Forte was launched, based on the selection of accesses of the species Passiflora cincinnata, native to the Caatinga and with production potential of up to 30 tons / ha / year. The prospect is that in the next years, the same is done with other native food species.

f) **Resilience:** Natural capital and ecosystem services have been instrumental in resilience of important sectors of the national economy, such as agriculture, energy, fisheries, forestry, and extractivism. As knowledge about Brazilian biodiversity increases, so does the variety of food options for wild relatives of cultivated species, and new sources of fiber, medicines, essential oils and a variety of other products.

g) **Sustainable intensification:** The diversification of agricultural crops with the introduction of native species more resistant to drought, pests and diseases can help to significantly reduce the use of agrochemicals. In addition, it enables a more balanced environment for the organic production system, diversifying the supply of food and reducing the effects of the seasonality of some products. Increasing diversity is a fundamental condition for the implementation of mixed systems, such as agroforestry and agroforestry systems, for example, which benefit from increased possibilities of crop combinations.

What specific actions have you undertake to strengthen the contribution of biodiversity for food and agriculture to improving these outcomes? For each of these aspects, briefly describe the nature and scale of the actions implemented, the production systems involved, and the outcomes, results obtained or lessons learned from these actions.

Where available provide information on the components of biodiversity for food and agriculture involved, the stakeholders involved and the gender aspects of these actions. Note that information on policies, legislation or regulations should be reported in Chapter 5 and your response here should be concerned with interventions at production system level.

59. Do you have information on the proportion of the population in your country that uses wild food on a regular basis for food and nutrition? If available, include information such as the proportion of the diet that is collected from the wild in normal time and in times of scarcity, drought, natural and human-made disaster, and the degree to which wild foods are used (for subsistence, supplementing, nutrition, other).

- It unknown how many people use wild foods on a regular basis, although the figures are high, mainly among rural peoples, represented by ca. 31.3 million peoples. Increasing availability of wild foods (eg. Brazil nut, pequi, açaí, umbu, pinhão, buriti, palmito, among others) is being regularly commercialized, either formally or informally, highlighting the increasing demand for products from biodiversity. In the last decade, an increasing number of products and increasing volume is being commercialized from small fairs and roadsides to large, sophisticated, supermarkets. Wild food is regularly consumed by rural people, and with not the same frequency by urban people.

- In Brazil, there are no official data on the percentage of the population that regularly consumes native (Wild) species in their diet. It is a matter of great complexity and, for a realistic analysis, needs to consider the ethnic and environmental diversity and the economic aspects that forms the population of Brazil. However, based on the observations of the feeding habits in the different regions of the country, it is possible to infer that native species are part of the diet of a very expressive contingent of the Brazilian population although the species used (plants and animals) and the intensity of the use may vary by region.

- In the case of plants, there are species of restricted regional use, such as the pequi (*Caryocar brasiliensis*) and the gueroba (*Syagrus oleracea*) that are part of the daily diet of the central-west region of Brazil; the chicória (*Eryngium foetidum*) and the cupuaçu (*Theobroma grandiflorum*) are frequently consumed in the Northern Region; the umbu (*Spondias mombin*) is more consumed in the Northeast; the mangarito (*Xanthosoma riedeianum*) and the ora-pro-nobis *(Pereskia aculeata*) are part of important dishes of the Southeast region cuisine.

- On the other hand, species such as açaí (*Euterpe oleracea*), pupunha (*Bactris gasipaes*), cará (*Dioscorea* spp.) and taioba (*Xanthosoma taioba*) are part of the daily diet, especially of the urban population, in all regions of the country and are easily found in street markets and supermarkets.

- In the specific case of the use of wild animals on diet the situation is more complex and, possibly, the number of people who regularly eat those animals is small, restricted only to indigenous peoples and some traditional communities. Brazil has a high diversity of wild animals, however, much of it is threatened with extinction, mainly, due to deforestation, habitat fragmentation and hunting pressure. Those processes act synergistically and lead to an accelerated extinction process of native fauna. Hunting is prohibited in the country, although there are some movements pressing the federal government for its legalization in special situations. The products from hunting are mostly destined to family feeding, without involving commercialization and presents very distinct regional characteristics. There is a preference for cervids, tapirs, agouti, pacas, wild pigs, armadillos, monkeys, coatis, jacus, partridges and turtles.

The adoption of ecosystem approaches

60. Describe in Table 24 the extent to which you consider that ecosystem approaches[25] have been adopted for the different production systems in your country (widely adopted (2),

[25] The ecosystem approach concept is generally understood to encompass the management of human activities, based on the best understanding of the ecological interactions and processes, so as to ensure that ecosystems structure and functions are sustained for the benefit of present and future generations.

partially adopted (1), not adopted (0), not applicable (NA)) and indicate whether ecosystem approaches are considered of major importance (2), some importance (1), no importance (0), not applicable (NA). You may also want to describe landscape approaches[26] that have been adopted in your country.

Table 24. Adoption of and importance assigned to ecosystem approaches in production systems in the Country.

Production systems **Code or name**	**Ecosystem approach adopted (name)**	**Extent of adoption (2,1,0,NA)**	**Importance assigned to the ecosystem approach (2,1,0,NA)**
Livestock grassland-based systems	NK	NK	NK
Livestock landless systems	NK	NK	NK
Naturally regenerated forests	NK	NK	NK
Planted forests	NK	NK	NK
Self-recruiting capture fisheries	NK	NK	NK
Culture-based fisheries	NK	NK	NK
Fed aquaculture	NK	NK	NK
Non-fed aquaculture	NK	NK	NK
Irrigated crops (rice)	NK	NK	NK
Irrigated crops (other)	NK	NK	NK
Rainfed crops	NK	NK	NK
Mixed systems (livestock, crop, forest and /or aquatic and fisheries)	NK	NK	NK
Mixed forests	NK	NK	NK
Organic systems	NK	NK	NK
Extractive systems	NK	NK	NK

Note: Data marked with NK (not known) does not necessarily mean absence of data, but only that the information was not readily available. Methodologies should be developed to answer this question, including statistical analyzes of the data.

61. For each production system in which an ecosystem and landscape approach has been widely adopted (as indicated in Table 24) describe:

a) The specific actions that have been taken to ensure adoption;

b) Any observed results from adoption;

c) Plans for adoption or for further adoption in new or existing production areas;

Ecosystem approaches include the Convention on Biological Diversity's Ecosystem Approach, Integrated Land Use Planning, Integrated Water Resource Management, Sustainable Forest Management, Code of Conduct for Responsible Fisheries, Ecosystem approach to fisheries management, etc.

[26] A "landscape approach" means taking both a geographical and socio-economic approach to managing the land, water and forest resources that form the foundation – the natural capital – for meeting our goals of food security and inclusive green growth. By taking into account the inter-actions between these core elements of natural capital and the ecosystem services they produce, rather than considering them in isolation from one another, we are better able to maximize productivity, improve livelihoods, and reduce negative environmental impacts.

d) Lessons learned.

Gaps and priorities

62. With respect to the use of management practices or actions that favor or involve the use of biodiversity for food and agriculture:

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

- With regard to aquatic resources, one of the greatest challenges is still the generation of essential information on existing stocks and the development of adequate systems for monitoring and sustainable exploitation.
- As for Conservation Units, it is necessary to develop strategies to achieve effective and equitable management of protected areas, as well as to ensure ecological interconnection, integration and representativeness in broader land and sea landscapes.

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 to meet the demands of the area.

c) What are the main policy and institutional constraints?

- Work in an integrated manner to comply with international commitments (CBD and Aichi Targets) and national (National Biodiversity Targets);
- Meeting national expectations for economic growth and poverty reduction, supported by a development model strongly dependent on conventional models for the use of natural resources;
- Build the necessary articulation at national level among political actors responsible for developing policies and strategies that influence (or are influenced) by the condition of ecosystems;
- Define and prioritize clear policies and sectoral instruments to foster the internalization of the economic benefits resulting from the sustainable use of natural resources, as well as engaging decision makers.

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

- Continue and increase investments in the generation of knowledge and skills;
- Invest in the continuous improvement of environmental monitoring and inspection activities;
- Integrate biodiversity issues into sectoral programs and policies;
- Increase the scale of the several other initiatives that have already been implemented to achieve the achievement of the National Biodiversity Targets for 2020.

63. With respect to the sustainable use of biodiversity for food and agriculture:

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

- The realization of fauna and flora inventories that allow to cover larger areas within one or several biomes. In general, these records tend to be more concentrated in easily accessible and densely populated regions, leaving large ranges of biomes outside of these studies (veil line), leading to large knowledge gaps on species diversity.

- There is no technical guidance on the propagation, cultivation or management of most native species with potential for economic use. Information on productivity, sustainable use, rate of resource collection, and information that enables commercial cultivation and genetic improvement of these species is also rare.

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 to meet the demands of the area.

c) What are the main policy and institutional constraints?

- Policies for changing and/or adapting the curriculum of the Agrarian and Biological Sciences courses, with the inclusion of specific disciplines on the use and importance of biodiversity for food and agriculture, with a view to expanding the training of professionals, as well as promoting a broader awareness of the use and valorization of Brazilian biodiversity.

- Improve the synergy and integration between the various existing public policies that aim at regional development and the sustainable use of biodiversity.

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

- Expand studies of forest inventories for areas not yet fully covered;

- For native species of extractive exploitation, expand studies to define good practices for sustainable use, as has already been done for babassu (*Attalea speciosa)*, Brazil nut (*Bertholletia excelsa*) and Carnauba (*Copernicia prunifera*).

- To develop agronomic studies that subsidize the elaboration of minimal packages of technology, that allow the commercial cultivation of native species;

- Discuss with the Universities the adaptation of curricula of the courses to the inclusion of specific disciplines on biodiversity, especially in undergraduate courses, where the subject is still approached quite superficially.

- Work the demands, through fairs and events that promote biodiversity and its flavors, so that society in general knows the richness of food provided by Brazilian biodiversity and understands the importance of its use, as a way of preserving the national heritage.

64. With respect to the contribution of biodiversity for food and agriculture to improving productivity, food security and nutrition, livelihoods, ecosystem services, sustainability, resilience and sustainable intensification:

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

- Know the effects of the increase or loss of biodiversity on each of the systems described above;

- There are no studies on the percentage of the Brazilian population that uses biodiversity, not only from a nutritional and nutritional point of view, but also that it makes use of phytotherapics, which grows in organic agriculture, in the production of meat, milk, honey, recovery of degraded ecosystems, among other services;

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 to meet the demands of the area.

- Still in relation to the limitations of human capital, a deeper knowledge of biodiversity requires the presence of professionals specialized in the dynamics of each region / biome, prepared to deal with and understand the seasonal variations and climatic extremes - increasingly common - and with the ability to recognize the dynamics and potential of biological diversity.

c) What are the main policy and institutional constraints?

- Develop tools and policies and improve existing ones to more effectively measure the positive impacts of the use of biodiversity on the country's economy. After all, the concept of biodiversity has gained prominence because many of its elements provide environmental services that are worth billions of reais per year and can be traded; are necessary to maintain the quality of life; are closely related to many of the traditional knowledge and cultures; and make up the base of most tourist attractions.

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

- Invest in technical vocational training, so that the knowledge generated by scientific studies can be interpreted and put into practice by the rural producers;

- To develop tools to evaluate the percentage of the Brazilian population that benefits directly and indirectly from native biodiversity, as well as the impacts thereof for food and nutritional security;

- Increase, through public policies, the incentives for agro-ecological based agriculture, which focus on maintaining biodiversity and ecosystem services.

65. With respect to the adoption of ecosystem approaches:

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

- Broaden the knowledge of biodiversity as a whole and not only of isolated parts. Biodiversity consists not only of static units (species), but also of processes such as carbon stocking, nutrient cycling, pollination and genetic selection critical to the viability of extractive, biotechnological and agricultural industries. Much of the biodiversity is in

micro-organisms and it may take years of intensive study to get a sense of the hidden biodiversity within the soil and tissues of other living things.

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 to meet the demands of the area.

- Still in relation to the limitations of human capital, a deeper knowledge of biodiversity requires the presence of professionals specialized in the dynamics of each region / biome, prepared to deal with and understand the seasonal variations and climatic extremes - increasingly common - and with the ability to recognize the dynamics and potential of biological diversity.

c) What are the main policy and institutional constraints?

- Develop tools and policies and improve existing ones to more effectively measure the positive impacts of the use of biodiversity on the country's economy. After all, the concept of biodiversity has gained prominence because many of its elements provide environmental services that are worth billions of reais per year and can be traded; are necessary to maintain the quality of life; are closely related to many of the traditional knowledge and cultures; and make up the base of most tourist attractions.

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

- Invest in technical vocational training, so that the knowledge generated by scientific studies can be interpreted and put into practice by the rural producers;

- To develop tools to evaluate the percentage of the Brazilian population that benefits directly and indirectly from native biodiversity, as well as the impacts thereof for food and nutritional security;

- Increase, through public policies, the incentives for agro-ecological based agriculture, which focus on maintaining biodiversity and ecosystem services.

CHAPTER 5: The state of interventions on conservation and use 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 provide an assessment and analysis of national and local interventions and activities, along with the state of international collaboration, that support conservation and sustainable use of biodiversity for food and agriculture. The analysis of interventions specific to plant, animal, forest and aquatic genetic resources will be based on the information provided in the respective State of the World Reports.

Information on the following topics should be covered in the Country Report:

- National policies, programmes and enabling frameworks that support or influence conservation and sustainable use of biodiversity for food and agriculture and the provision of ecosystem services;
- Policies, programmes and enabling frameworks governing exchange, access and benefits;
- Information management;
- Local and informal-sector actors and initiatives;
- Availability of capacity and resources;
- Participation in international and regional policies, legal frameworks and collaboration with other countries;
- Knowledge generation and science for the management and sustainable use of biodiversity for food and agriculture.

National policies[27], programmes[28] and enabling frameworks that support or influence conservation and sustainable use of biodiversity for food and agriculture and the provision of ecosystem services

66. Identify and describe the main policies, programmes and enabling frameworks that support or specifically address the objectives below, briefly describing the policies, programmes or enabling frameworks listed and provide any available information on the extent of implementation or of lessons learned. For each objective, list up to 10 major policies, programmes and enabling frameworks.

a) Support the integrated conservation and sustainable use of biodiversity for food and agriculture across sectors[29];

- Agricultural Policy for Planted Forests (Decree 8.375/2014).

- Agricultural Risk Zoning (ZARC) is an instrument of agricultural policy and risk management in agriculture. The study is designed with the objective of minimizing the risks related to adverse climatic phenomena and allows each municipality to identify the best planting season of the crops, in the different types of soil and crop cycles. The technique is easily understood and adopted by farmers, financial agents and other users.

- National Policy for the Sustainable Development of Aquaculture and Fisheries, regulates fishing activities.

- The National Biodiversity Policy, the Biodiversity Strategy and Action Plan (NBSAP) together with the CBD National Targets for 2020 pursue the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising from the utilization of the genetic resources, components of the genetic heritage and associated traditional knowledge.

[27] Policies include laws and legislature, as well as regulations, certification procedures and other mechanisms that incentivize conservation and sustainable use of biodiversity for food and agriculture.

[28] Programmes include initiatives and actions implemented and organized at all levels from community and stakeholder groups to national and regional organizations, as well as local implementation of international programmes.

[29] Countries that previously presented or are currently preparing a Country Report on Forest, Aquatic, Animal or Plant Genetic Resources may wish to use information from their different sector reports.

- The National Plan for the Promotion of Sociobiodiversity Production Chains (PNPPS) seeks to promote the sustainable use of biodiversity and ensure generation of alternative incomes for rural communities through access to credit, technical assistance and rural extension, markets and trade instruments and guaranteeing a minimum price.

- The General Policy of Minimum Prices for Sociobiodiversity (PGPMBio) was established through Decree-Law No. 79 (1996), which defined criteria for the establishment of minimum prices and procurement of agricultural products. More recently, Law No. 11775 (2008) established a direct subsidy to producers, including for biodiversity products. Under this policy, a subsidy is paid to those agroextractivists that could not market their product at the minimum price established by the Federal Government. The subsidy is the difference between the minimum price and the value of the sale. The Brazilian Government has selected 30 NTFP species for priority intervention aimed to promote their sustainable use. Of these, 13 species have minimum prices established under the PGPMBio. Additionally, eight new species are being considered for inclusion in the PGPMBio policy, namely: buriti (*Mauritia flexuosa*); murumuru (*Astrocaryum murumuru*), macaúba (*Acrocomia aculeata*), fava d'anta (*Dimorphandra mollis*), licuri (*Syagrus coronata*), maracujá do mato (*Passiflora cincinnata*.), erva mate (*Ilex paraguariensis*) and processed piaçava (*Attalea funifera*).

- The National Program for Strengthening of Family Agriculture (PRONAF) established in 1996 provide financing to family farmers for agricultural production. PRONAF is an important tool to promote a greater political visibility of family farming in the country and has facilitated access to credits to 781,000 farmers. Although the number is low compared to the total number of farms in the country, the program has nevertheless supported a significant increase in the volume of food produced by family farming and improvement of the socioeconomic conditions of many families, It has also had important impacts on Municipalities, increasing job opportunities, revenues and rising the municipal sector GDP. Disbursements of credits under the program increased from US$0.72 billion in 2001 to US$ 11 billion in 2013.

- The Food Acquisition Program (PAA) was established in 2003 with the objectives of promoting access to food by people in a situation of food insecurity and promoting social and economic inclusion in the rural areas by strengthening family agriculture. Under the program, the federal government purchases family farmers´ products, paying a limited amount to each farmer, stores the products and freely distributes them in areas where social vulnerability is higher. The PAA is part of the PGPMBio, but it is not restricted to products that have a minimum price; it also purchases NTFPs and AFS products that are not supported by the PGPMBio. Between 2003-2010 the PPA invested a total of US$ 1,6 billion purchasing farm products from an average of about 112,000 farmers annually (2.6% of Brazilian family farmers).

- The National School Lunch Program (PNAE), was established in 1955 and aims to partially meet the nutritional needs of students through the provision of at least one meal a day in all public schools registered in the school census, seeking to fulfill the nutritional requirements during the school year. Since 2009 the PNAE

ensures that at least 30% of the funds transferred from the National Fund for the Development of Education (FNAE) to the Municipalities (which are in charge of purchasing and distributing products to schools) are invested in procuring family agriculture products. In 2014, US$ 1,6 billion will be allocated to school lunches, and 30% would represent an injection of US$ 480 million to family farming, including NTFP food products.

- The PAA and PNAE represent major advances and opportunities for family farmers, indigenous peoples and traditional communities since both programs offer a regular and stable institutional market, and promote sustainable food production based on livelihoods. Most of the NTFP species supported by public procurement policies come from the Amazon, Cerrado and Caatinga biomes.

- The National Policy of Technical Assistance and Rural Extension (PNATER) was established in 2003 and its objective is to promote and facilitate the processes that contribute to the construction and implementation of strategies for sustainable rural development, focusing on the expansion and strengthening of family farming and their organizations, through educational and participatory methodologies integrated to the local dynamics, seeking to create viable conditions for the exercise of citizenship and improving the quality of life of society.

- The National Policy for Sustainable Development of Traditional Peoples and Communities (PNPCT) was launched in 2007 with the main objective of promoting the sustainable development of traditional peoples and communities, emphasizing in the recognition, strengthening and guaranteeing of their territorial, social, environmental, economic and cultural rights, with respect and appreciation to their identity, their organization and their institutions. A board composed of 15 federal governmental institutions, plus 15 representatives of non-governmental institutions, coordinates and works to reach the policy´s objectives.

b) Support the conservation and sustainable use of associated biodiversity;

- Among the 1,173 species of fauna threatened with extinction that can be considered pollinators, there are 85 bird species (potentially frugivorous, nectarivorous and omnivorous), 63 lepidopteran species, 29 beetle species, seven bat species and four bee species. The later are classified in the category "Endangered (EN)":
  - *Melipona* (Michmelia) *capixaba* (uruçu-preto)
  - *Melipona* (Michmelia*) rufiventris* (tujuba)
  - *Melipona* (Michmelia) *scutellaris* (uruçu)
  - *Partamona littoralis* (popular name is unknown)

- Because these species are listed in the Ministerial Order n. 444/2014, they are fully protected. Therefore, the capture, transportation, storage, custody and handling of their specimens may be permitted for research purposes or for species conservation, with an official authorization. On the other side, processing and marketing are prohibited. However, such restrictions do not apply to specimens reproduced in captivity duly licensed by a competent environmental agency in accordance with National Action Plans for Conservation of Species Threatened With Extinction (PAN), when existing. PAN are elaborated with the

purpose of defining actions in situ (in the natural habitat) and ex situ (outside the natural habitat) for conservation and recovery of these species.

- The National Plan for the Promotion of Sociobiodiversity Production Chains (PNPPS) seeks to promote the sustainable use of biodiversity and ensure generation of alternative incomes for rural communities through access to credit, technical assistance and rural extension, markets and trade instruments and guaranteeing a minimum price.

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- The National School Lunch Program (PNAE), was established in 1955 and aims

to partially meet the nutritional needs of students through the provision of at least one meal a day in all public schools registered in the school census, seeking to fulfill the nutritional requirements during the school year. Since 2009 the PNAE ensures that at least 30% of the funds transferred from the National Fund for the Development of Education (FNAE) to the Municipalities (which are in charge of purchasing and distributing products to schools) are invested in procuring family agriculture products. In 2014, US$ 1,6 billion will be allocated to school lunches, and 30% would represent an injection of US$ 480 million to family farming, including NTFP food products.

c) Address food security and nutrition with explicit reference to biodiversity for food and agriculture, associated biodiversity and/or wild foods;

- The Biodiversity for Food and Nutrition Project—officially the *Mainstreaming Biodiversity Conservation and Sustainable Use for Improved Human Nutrition and Well-being* project, or *BFN project*, is a multi-country initiative funded by the GEF with an ambitious goal to mainstream biodiversity conservation to improve nutrition in four countries: Kenya, Sri Lanka, Turkey, and Brazil. The BFN Project is coordinated by Bioversity International and co-implemented by FAO and UNEP. In Brazil, the BFN project tries to mainstream biodiversity conservation and sustainable use for improved nutrition into national food and livelihood security strategies formed or strengthened under Fome Zero Strategy. Part of the Project's objective is improving the enabling environment for biodiversity for food and nutrition in Brazil. The first step was to strengthen the evidence and knowledge base for the nutritional value of native biodiversity. The BFN Nutritional Composition Database will provide important evidence for the inclusion of nutritious species (wild foods) in public policies and programs focused on food and nutritional security and the promotion of healthy and diversified diets. It will also provide evidence for programs linking biodiversity conservation to income generation.

- The BFN project in Brazil has identified four existing public policies that could benefit from data on the nutritional value of wild foods. They include the Food Acquisition Program (PAA), the National School Meals Program (PNAE), the National Food and Nutrition Policy (PNAN) and the Minimum Price Guarantee Policy for Biodiversity Products (PGPM-Bio).

- The National Policy on Agroecology and Organic Production was established by the Federal Decree n. 7,794, of 20th August 2012. One of its guidelines is the promotion of food and nutritional sovereignty and security and the human right to adequate and healthy food, by means of the provision of organic and agro-ecological products that are free of contaminants that endanger health. One of the instruments of this policy is the National Plan of Agroecology and Organic Production (PLANAPO). In the framework of PLANAPO, in order to promote the agroecological transition by an increasing number of producers, as well as the replacement of conventional pesticides by low toxicity and biological inputs, the proposal of the National Program for Reduction of Pesticide Use (PRONARA) was developed by the Working Group on Pesticides, of the National Commission

of Agroecology and Organic Production (CNAPO[30]). This proposal has been discussed and its publication is awaiting approval by all the Ministries involved in the issue.

- The National Plan for the Promotion of Sociobiodiversity Production Chains (PNPPS) seeks to promote the sustainable use of biodiversity and ensure generation of alternative incomes for rural communities through access to credit, technical assistance and rural extension, markets and trade instruments and guaranteeing a minimum price.

- The National School Lunch Program (PNAE), was established in 1955 and aims to partially meet the nutritional needs of students through the provision of at least one meal a day in all public schools registered in the school census, seeking to fulfill the nutritional requirements during the school year. Since 2009 the PNAE ensures that at least 30% of the funds transferred from the National Fund for the Development of Education (FNAE) to the Municipalities (which are in charge of purchasing and distributing products to schools) are invested in procuring family agriculture products. In 2014, US$ 1,6 billion will be allocated to school lunches, and 30% would represent an injection of US$ 480 million to family farming, including NTFP food products.

d) Address the maintenance of ecosystem services with explicit reference to biodiversity for food and, associated biodiversity and/or wild foods;

- Water Producer Program - The Water Producer Program aims to reduce erosion and sedimentation of water sources in rural areas. The voluntary compliance program provides technical and financial support for the implementation of water and soil conservation actions, such as the construction of terraces and infiltration basins, the rehabilitation of secondary roads, the recovery and protection of water, reforestation of permanent protection areas and legal reserve, environmental sanitation. It also provides for the payment of incentives (or a kind of financial compensation) to rural producers who have proven to contribute to the protection and recovery of springs, generating benefits for the basin and the population. The incentives are granted only after partial or total implementation of previously contracted conservation actions and practices and the amounts to be paid are calculated according to the results: reduction of erosion and sedimentation, reduction of diffuse pollution and increase of infiltration of water in the soil.

- Environmental Reevaluation for Neonicotinoid Pesticides
  - The applications of pesticides containing imidacloprid, thiamethoxam, clothianidin or fipronil, regardless of the technology used, during the flowering season, have been prohibited, with some flexibilizations, since 2012[31].

[30] Available on http://www.secretariageral.gov.br/atuacao/brasil-agroecologico/comissao-nacional-de-agroecologia-e-producao-organica; access on 15th May 2017.

[31] Federal Official Gazette, of 4th January 2013, section 1, page 10 – MAPA Joint Normative Instruction n. 1; Federal Official Gazette, of 5th December 2013, section 1, page 7 – MAPA Joint Normative Instruction n. 30; Federal Official Gazette, of 10th April 2014, section 3, page 129 – IBAMA Statement n. 1.

- Normative Instruction IBAMA n. 2, of 9th February 2017[32], establishes guidelines, requirements and procedures for pesticide risk assessment for pollinator insects, using bees as indicator-organisms.

e) Improve resilience and sustainability of production systems with explicit reference to biodiversity for food and agriculture, associated biodiversity and/or wild foods;

- Programa ABC (Low Carbon Agriculture Program) – Actions to be taken to adopt the sustainable production technologies selected to meet the commitments to reduce greenhouse gas emissions.

- National Policy for the Sustainable Development of Aquaculture and Fisheries, regulates fishing activities.

- Environmental Regularization Program (PRA) - Program that aims at the environmental regularization of properties and environmental liabilities identified in the CAR (Rural Environmental Register), both in Permanent Preservation Areas (APPs) and in Legal Reserves RLs, through the elaboration, implementation and monitoring of Recovery of degraded areas projects (PRADAs).

- Sustainable Rural Project - A cooperation project to promote sustainable rural development, aimed at the broad adoption by rural producers of low-carbon agricultural technologies that will restore the productive potential of degraded agricultural areas and allow restoration of legal maintenance areas of native vegetation.

- Integrated Agricultural Production - Integrated Agricultural Production is focused on the adaptation of productive systems for the generation of high quality food.

- National Plan of Agroecology and Organic Production (PLANAPO) - It aims to implement programs and actions that encourage the agroecological transition, organic production and agro-ecological basis, enabling the population to improve the quality of life through the supply and consumption of healthy food and the sustainable use of natural resources, constituting an instrument of national police (Pnapo) operationalization and monitoring, evaluation and social control of the actions organized there.

- The National Policy for Sustainable Development of Traditional Peoples and Communities (PNPCT) was launched in 2007 with the main objective of promoting the sustainable development of traditional peoples and communities, emphasizing in the recognition, strengthening and guaranteeing of their territorial, social, environmental, economic and cultural rights, with respect and appreciation to their identity, their organization and their institutions. A board composed of 15 federal governmental institutions, plus 15 representatives of non-governmental institutions, coordinates and works to reach the policy´s objectives.

[32] Federal Official Gazette, of 10th February 2017, section 1, pages 33-36 – IBAMA Normative Instruction n. 2.

f) Support farmers, pastoralists, forest dwellers and fisher folk to adopt and maintain practices that strengthen the conservation and use of biodiversity for food and agriculture.

- ABC Program (Low Carbon Agriculture Program) – Actions to be taken to adopt the sustainable production technologies selected to meet the commitments to reduce greenhouse gas emissions.

- The National Policy for Sustainable Development of Traditional Peoples and Communities (PNPCT) was launched in 2007 with the main objective of promoting the sustainable development of traditional peoples and communities, emphasizing in the recognition, strengthening and guaranteeing of their territorial, social, environmental, economic and cultural rights, with respect and appreciation to their identity, their organization and their institutions. A board composed of 15 federal governmental institutions, plus 15 representatives of non-governmental institutions, coordinates and works to reach the policy´s objectives.

- Project Mainstreaming Biodiversity Conservation and Sustainable Use into NTFP and AFS production practices in Multiple-Use Forest Landscapes of High Conservation Value (Projeto Bem Diverso)- The project´s objective is 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 agro-forestry systems (AFS). It will support Brazil's goal of promoting the conservation and sustainable use of biodiversity while reducing poverty and increasing resilience in the rural areas, which are governmental objectives stated in public policies and programs. The project will conserve biodiversity in key forest landscapes - Amazon, Caatinga and Cerrado - all renowned for their outstanding global biodiversity significance but currently under threat from increasing land use pressures across production landscapes. It will address one of the key land use threats to these forests, which is forest degradation driven by small-scale farmers that employ traditional subsistence farming and extraction practices in and around forested areas throughout the landscape, including land clearing, over-exploitation of resources, and poor fire management. This is causing increased encroachment on forest habitats both in areas under conservation and in locations that are strategic for connectivity across the landscape with the result of gradual loss of the global environmental values in these areas. It will seek to facilitate a shift from these unsustainable agricultural practices to an approach that conserves the biodiversity of multiple-use forest landscapes of high conservation value while meeting important social priorities and development goals. The project will therefore focus on the development of a strengthened sustainable use management framework for sustainable NTFP and AFS production. This will be achieved through two Outcomes: 1) Governance and capacity building framework for up-scaling best practices for BD sustainable management and production, and 2) Market and financial frameworks for up-scaling for NTFP and AFS production in high-conservation value forest landscapes. By removing current risks and uncertainties, the project will contribute to the upscaling of sustainable NTFP and AFS production while at the same time enhancing the rights and roles of communities in the sustainable management of BD and improving their livelihoods. Up-scaling and integration of AFS production will provide more environmentally friendly forms of land use in a landscape-level

mosaic, increasing connectivity of forest fragments and helping to maintain ecosystem services.

67. List up to 10 major policies, programmes and enabling frameworks in your country that enhance the application of an ecosystem approach[33] or a landscape approach[34] and that contain an explicit reference to biodiversity for food and agriculture, associated biodiversity and/or wild foods. Include a brief description of the policies, programmes and enabling frameworks together with any information on the extent of their application (production system and area) and observed effect. Where possible provide examples of best practices or lessons learned.

Briefly describe policies, programmes and enabling frameworks that meet the objectives described in questions 68 and 69. Consider the following discussion points in your responses, where information is available:

a) extent of implementation;
b) production systems involved;
c) the extent of use of biodiversity for agriculture;
d) lessons learned;
e) evidence of indicators of vulnerability that have decreased as a result of these efforts;
f) describe the value added of mainstreaming gender in programmes, policies and enabling frameworks, providing sex-disaggregated data where possible.

- The application of an ecosystem/landscape/seascape approach currently occurs most at the level of programs and projects. This integrative approach allows optimizing efforts to ensure the conservation and sustainable use of biodiversity. As an example, in the political sphere we have the definition of Priority Areas for conservation, sustainable use and benefit sharing of biodiversity, that serves as a public policy instrument to support decision making in an objective and participatory way in planning and implementation of actions such as creation of conservation units, licensing, inspection and promotion of sustainable use. In addition, recent projects have presented this approach in their conception as for example the GEF Amazon Sustainable Landscapes program that seeks to promote actions within PAs and in their surroundings in order to reestablish the connectivity of the ecosystem and to guarantee the conservation and the sustainable use of biodiversity throughout the biome.

- Rural Environmental Register (CAR): Register in a single database all the rural properties of the country with the respective spatial allocation and verification of the

[33] The ecosystem approach concept is generally understood to encompass the management of human activities, based on the best understanding of the ecological interactions and processes, so as to ensure that ecosystems structure and functions are sustained for the benefit of present and future generations. Ecosystem approaches include the Convention on Biological Diversity's Ecosystem Approach, Integrated Land Use Planning, Integrated Water Resource Management, Sustainable Forest Management, Code of Conduct for Responsible Fisheries, Ecosystem approach to fisheries management, etc.

[34] A "landscape approach" means taking both a geographical and socio-economic approach to managing the land, water and forest resources that form the foundation – the natural capital – for meeting our goals of food security and inclusive green growth. By taking into account the inter-actions between these core elements of natural capital and the ecosystem services they produce, rather than considering them in isolation from one another, we are better able to maximize productivity, improve livelihoods, and reduce negative environmental impacts.

conservation status of the Permanent Preservation Areas (APPs), Legal Reserves (RLs) and Areas of Restricted Use (AUR). It is important to mention that up to April 2017, 4,104,247 rural properties were registered in CAR, totaling 851,576,705 ha in Brazil. Among the several important results of CAR, it is worth mentioning that Brazil is one of the few countries in the world that has an official record on environmental conservation within rural properties, which corresponds to 11% of the total number of native forests preserved in Brazil (Figure 9).

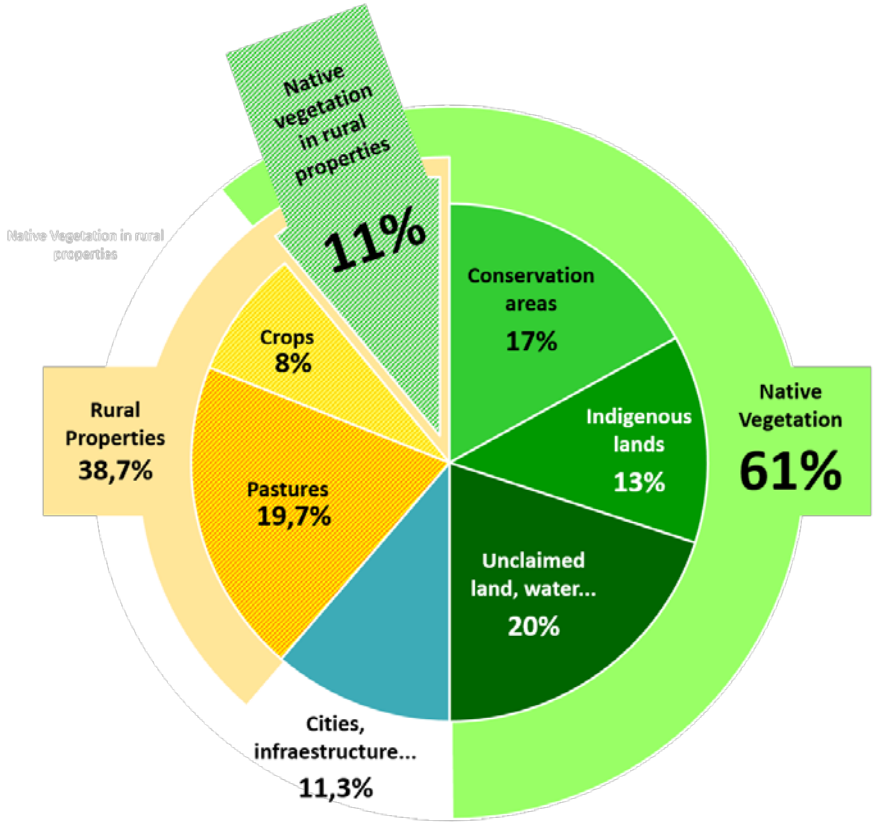

Figura 9. Land occupation and use in brazil. Source: Embrapa Satellite Monitoring, with dat from IBGE, CNA, MMA, FUNAI, DNIT, ANA, MPOG.

68. Describe up to 10 major policies, programmes and enabling frameworks in your country that embed the use of biodiversity for food and agriculture, including its different components, into disaster management and response.

- **National Plan for the Prevention of Natural Disasters:** It aims to ensure the safety of populations living in areas susceptible to natural disasters and to preserve the environment. The plan works on four fronts: prevention, mapping, monitoring and response. Prevention includes the works of the Growth Acceleration Program (PAC) aimed at reducing the risk of natural disasters, including structural works to prevent floods and landslides such as drainage and containment of slopes. This axis also includes actions to combat the effects of drought such as the construction of dams, water mains and urban water supply systems in nine states in the Northeast and in the semi-arid region of Minas Gerais. The mapping involves the identification of risk areas for

landslides and floods, supporting the development of geotechnical charts of urban aptitude, which will allow the establishment of urban planning guidelines for the design of new lots.

- **Reference Centers for Recovery of Degraded Areas (CRADs):** In order to promote the recovery of degraded areas, it was created Reference Centers for Recovery of Degraded Areas (CRADs). The objectives of the CRADs are linked to the development of recovery models for degraded areas in demonstration areas, to the definition and documentation of procedures to facilitate the replication of rehabilitation actions for degraded areas, and the promotion of training courses for human resources training (collection of seed, production of seedlings, planting, silvicultural treatments). Currently there are seven CRADs in operation, all in the São Francisco River Basin, in the Northeast Region.

- **Rural Environmental Registry:** National electronic public registry, mandatory for all rural properties, with the purpose of integrating the environmental information of the properties and rural properties related to the Permanent Preservation Areas - APP, of restricted use, Legal Reserve, remnants of forests and other forms of native vegetation, and consolidated areas, composing a database for control, monitoring, environmental and economic planning, and combating deforestation. The registration in the CAR is the first step to obtain the environmental regularity of the property, and includes: data of the owner, rural owner or directly responsible for the rural property; data on documents proving ownership and possession; and georeferenced information on the perimeter of the property, areas of social interest and areas of public utility, with information on the location of remnants of native vegetation, Permanent Preservation Areas, Restricted Use areas, consolidated areas and Legal Reserves.

69. Describe up to 10 major policies, programmes and enabling frameworks in your country that embed the use of biodiversity for food and agriculture, including its different components, into climate change adaptation and mitigation strategies and plans (NAPAs, NAPs, NAMAs, etc.[35]).

- **National Plan for Agroecology and Organic Production:** Implementation of sustainable food production and distribution systems with emphasis on the promotion of agroecological systems, preservation and enhancement of agrobiodiversity, creation of seed banks, productive diversification, and recovery and preservation of soils and water sources.

- **ABC Program** (Low Carbon Agriculture Program): Actions to be taken to adopt the sustainable production technologies selected to meet the commitments to reduce greenhouse gas emissions.

- **National Policy on Climate Change:** instituted by Law No. 12,187, of 2009. Based on

[35] NAPAs - National adaptation programmes of action (NAPAs) provide a process for Least Developed Countries (LDCs) to identify priority activities that respond to their urgent and immediate needs to adapt to climate change – those for which further delay would increase vulnerability and/or costs at a later stage.
NAPs – the national adaptation plan (NAP) process is a means of identifying medium- and long-term adaptation needs and developing and implementing strategies and programmes to address those needs.
NAMAs- Nationally Appropriate Mitigation Actions - a set of policies and actions that countries undertake as part of a commitment to reduce greenhouse gas emissions.

legislation, it was defined strategies and proposes policies related to the monitoring and implementation of sectoral mitigation and adaptation plans. It also promotes technical and scientific cooperation with entities related to the subject so that the country reaches the voluntary commitments of reduction of emissions of greenhouse gases.

- **National Program for Strengthening Family Agriculture (PRONAF):** it has specific lines of credit for the financing of environmental conservation activities and the sustainable use of biodiversity, such as:
  - Pronaf Agroecology: Line for the financing of investments in agroecological or organic production systems, including costs related to the implementation and maintenance of the enterprise.
  - Pronaf Eco: Line for the financing of investments in techniques that minimize the impact of the rural activity on the environment, as well as allow the farmer better conviviality with the biome in which his property is inserted.
  - Pronaf Forest: Financing investments in projects for agroforestry systems; ecologically sustainable extractive exploitation, forest management plan, restoration and maintenance of permanent preservation areas and legal reserve and recovery of degraded areas.
  - Pronaf Semi-arid: Line for the financing of investments in projects with the semi-arid region, focused on the sustainability of agroecosystems, prioritizing water infrastructure and the implantation, expansion, recovery or modernization of other infrastructures, including those related to agricultural production and services projects and non-farming, according to the reality of the farming families of the semi-arid region.

70. What arrangements are in place or foreseen in your country that help to ensure that the conservation of biodiversity for food and agriculture is taken into account in national planning and policy development of sectors other than agriculture (e.g. NBSAPs or infrastructure development such as transport or energy)?

- **National Program for the Production and Use of Biodiesel:** program that aims at the sustainable implementation, production and use of biodiesel, with a focus on social inclusion and regional development, through the generation of employment and income. The main guidelines of the program are: to implement a sustainable program, promoting social inclusion; ensure competitive prices, quality and supply; produce biodiesel from different oil sources, strengthening the regional potentialities for the production of raw material. The program has promoted studies and research on the viability of the use of native species of Brazilian flora in the production of biodiesel, such as the macaúba (*Acrocomia aculeata*) and the caiaué (*Elaeis oleifera*).

- **Water Producer Program:** program that focuses on stimulating the policy of payment for environmental services focused on water protection in Brazil. It consists of remunerating the rural producer with values proportional to the environmental services provided, which benefit the society that lives in a certain river basin, besides offering technical assistance for the environmental recovery of the property. In 2017 resources should be applied to actions that include the adaptation of rural roads, agricultural terracing, forest remnant fencing, seedling planting of native species in each region, dam building (for rainwater harvesting and infiltration and for retention of sediments) and rural sanitation (with installation of septic tanks or similar structures).

71. Has your country identified any obstacles to developing and implementing legislation that would protect associated biodiversity? List and describe initiatives in Table 25.

Table 25. Obstacles to developing and implementing legislation that would protect associated biodiversity identified in the country.

Component of associated biodiversity	Obstacles to legislation for protection of associated biodiversity

[*Insert rows as needed*]

Provide a concise description of the obstacles to legislation reported in Table 25 and specify a course of action proposed to address this, where possible. Where possible provide examples of best practices or lessons learned.

Policies, programmes and enabling frameworks governing exchange, access and benefits

72. Has your country taken measures with the aim of ensuring that access to its genetic resources shall be subject to its prior informed consent (PIC) and that benefits arising from their utilization shall be shared in a fair and equitable manner? If yes, identify for which resources and for which uses (e.g. to conduct research and development on the genetic and/ or biochemical composition of the genetic resource) prior informed consent has to be obtained and benefits have to be shared. Indicate in Table 26 for the different categories (and possibly uses) of associated biodiversity, if prior informed consent has to be obtained and benefits have to be shared (Y: yes, N: no).

Table 26. Policies and programmes governing the access to its genetic resources of associated biodiversity established in the country.

Component of associated biodiversity	Intended use (e.g. any use, research and development, commercial use)	PIC and benefit-sharing required (Y/N)

[*Insert rows as needed*]

The new legal framework of Brazilian genetic heritage and associated traditional knowledge management (Law No. 13,123/2015 and Decree No. 8772/2016) reduces the financial and regulatory costs of Brazilian biodiversity research activities and technological development.

This new regulation contemplates several improvements in the government's management agenda. Management was facilitated by the creation of two electronic systems designed to oversee and trace activities resulting from access.

The National Management System of Genetic Heritage and Associated Traditional Knowledge - SisGen, is the interface between the administrated entities, users, providers and the Board of Genetic Heritage Management, thus fulfilling the obligations contained in Law No. 13,123. SisGen is the recipient of all the registries, authorizations, notifications of finished

products or reproductive materials, and generates the respective receipts and certificates.

The other system is the traceability system of the activities that result from access to genetic resources or associated traditional knowledge. It is one of the tools created by the legal framework that increased control over the traceability of accesses, remittances and dispatches, and brought improvements in the monitoring of benefit sharing. Such a system will have the collaboration of various public bodies that regulate different productive sectors, until reaching the sector of product registration for commercial exploitation. This legal norm also assigns government agencies the function of "checkpoints" to guarantee compliance with the law.

Through the implementation of these systems it will be possible to maintain and manage a greater amount of information on the use of genetic resources and associated traditional knowledge. Besides this, once connected to other databases and information systems from federal public administration, modern high efficiency instruments can be implemented that have the capacity to verify information on the activities resulting from access to genetic resources or associated traditional knowledge, as well as those that render economic return.

The law assures the participation of representatives from these groups in the Genetic Heritage Management Council - CGen, the national ABS authority, and the Steering Committee of the National Benefit Sharing Fund - also created by law.

Law No. 13,123/2015 also creates the National Program of Benefit-Sharing - PNRB which will be implemented by the National Benefit Sharing Fund - FNRB to apply resources in various initiatives such as the implementation of Sustainable Development Plans of Traditional Peoples and Communities, which will stimulate and strengthen the practices of peoples and communities that are relevant for biodiversity conservation.

It also promotes the integration of biodiversity conservation policies to strategies directed at poverty reduction and public health, as it fosters the responsible use of biodiversity for technological development and innovation in the area of biotechnology.

Another point of interest of the biodiversity-based productive chains is benefit sharing at a single point of the production chain. The law determines that the benefits arising from the commercialization finished product should be shared by the last manufacturer in the productive chain, or by the producer of the reproductive material (in case of agricultural activities). The Brazilian biodiversity-based production chains are very fragmented and have a large number of intermediate links that deal with the initial processing of raw materials. The above mentioned provision intends to exempt the cooperatives and micro businesses from unnecessary demands without sacrificing the traceability of the product, while at the same time directing the focus of the benefit sharing on the product with the most added value on the productive chain.

Brazilian law complies with provisions from international treaties, and foresees benefit sharing in monetary and non-monetary terms.

From the perspective of indigenous peoples, traditional communities and traditional farmers, Law No. 13,123/2015 guarantees the protection of their knowledge; the right to participate in national decision-making processes on matters related to the conservation and sustainable use of their traditional knowledge; and the free exchange and dissemination of genetic heritage and associated traditional knowledge practiced amongst them for their own benefit, based on their customs and traditions.

73. Has your country taken measures with the aim of ensuring that the prior informed consent or approval and involvement of indigenous and local communities is obtained for access to genetic resources and that benefits arising from the utilization of genetic

resources that are held by indigenous and local communities, are shared in a fair and equitable way with the communities concerned, based on mutually agreed terms? If yes, provide a description of the measures and where possible, examples of best practices or lessons learned.

Despite significant advances in the political organization and representation of indigenous peoples and traditional communities vis-à-vis government and society in general, it is still a challenge to find representative voices for the great diversity of these groups in order to achieve the effective inclusion of their demands in public policies. The Law 13,123/15 reformulated the Genetic Heritage Management Council (CGen) that now includes representatives from National Council for the Sustainable Development of Traditional Peoples and Communities (CNPCT), from Indigenous People National Council (CNPI), and from National Council for Sustainable Rural Development (Condraf), those representations were an important step, although other equally complex challenges remain, such as building reliable processes and sufficient capacity to meet the commitment of informed consultation, informed consent and fair and equitable sharing of benefits.

To meet this challenge, it was developed by *Grupo de Trabalho Amazonico - GTA*, an civil society network of Amazonian local organizations, a methodology for the participatory elaboration of Community Protocols. These protocols, specific to each community, define the conditions and terms of access to traditional knowledge or genetic resources and benefit sharing. The traditional communities of the Bailique Archipelago in the state of Amapá, for example, have participatedon the development of this methodology, which can be replicated to other traditional people and communities. The purpose of this initiative is to facilitate the dialogue among local populations and any external agent on biodiversity conservation, the sustainable use of natural resources and the sharing of benefits. Thus, the development of Community Protocols prepares the community to engage in fairer access contracts by strengthening local capacity to deal with the issue and by establishing conditions and terms that aremore equitable. This prior definition, in turn, also facilitates access procedures for interested companies, reducing initial costs, since the training for informed consent has already been established, and streamlines the process of obtaining validated contracts for access to knowledge and / or traditional resources and benefit sharing.

In 2001, Brazil published the Provisional Measure (MP) on Access and Benefit-Sharing at nº. 2,186-16/2001 and has since then endeavored to improve national legal instruments to regulate the provisions of the biodiversity conservation in relation to access to biodiversity resources associated traditional knowledge, and the benefits resulting from its use. Significant advances have been made in recent years, especially with the entry into force of Law 13.123 of May 20, 2015, which regulated access to genetic heritage, protection and access to associated traditional knowledge and the sharing of conservation benefits and sustainable use of biodiversity.

The MP nº. 2,186-16/2001 was an important milestone in the fight against biopiracy in Brazil. However, this norm made rigid and bureaucratic requirements for access to genetic heritage and associated traditional knowledge, which provoked criticism from the user sector, considering the high transactional cost, and by traditional peoples and communities, who have always demanded greater participation in the decision-making process. With the entry into force of Law 13,123 of May 20, 2015, which replaces the Provisional Measure, several demands were made by the civil society sectors, including representation in the Genetic Heritage Management Council (CGen) of the business, indigenous peoples, traditional communities and traditional farmers. The new legislation allows the CGen to make the national system of access and benefit sharing a tool for the economic, social, cultural and environmental development of our country, promoting the conservation of biodiversity.

Information management

74. List and describe any linkages between sector information systems on biodiversity for food and agriculture at national level. Where possible provide examples of best practices or lessons learned.

With the aim of popularizing the practice of citizen science in the country, the Brazilian Biodiversity Information System (SiBBr) launched in 2017 the online platform of the Brazilian Network of Citizen Science in Biodiversity (http://www.sibbr.gov .br / cienciacidada). In its first version, the tool presents information and access links for nine projects of different lines of research and continues to receive registrations of new initiatives. The Network aims to exchange Brazilian citizen science projects with joint communication tools and society engagement, and in a second step, the integration of data in the SiBBr database.

The online citizen science platform is the first step in integrating Brazilian projects into one place. It aims to strengthen the communication of initiatives that deal with biodiversity issues and facilitate the population's access to projects of interest, increasing the participation of people and working for the popularization of science in Brazil. The concept of citizen science is represented by a partnership between amateur researchers and scientists in data collection, in which the projects create a network of volunteers to assist in scientific research using methodologies developed by them or in collaboration with professional researchers. The "scientific citizens" are people who have chosen to dedicate themselves to science in their free time, assisting in the documentation of different research objects such as records of species occurrences, migration patterns, propagation of infectious diseases, among others. Citizen science has the potential to increase public participation in environmental management, interest in science, and environmental awareness.

75. Has your country established national information systems on associated biodiversity? List in Table 27, along with a description of the components of associated biodiversity addressed, and a brief description of information included, use and applications of the information system.

Table 27. National information systems on associated biodiversity in the Country.

National information system (List)	**Components of associated biodiversity addressed (List)**	**Concise description of information systems**
Phytosanitary Agrotoxic System (Agrofit)	Microorganisms, arthropods and pests, diseases, and weeds	Agrofit 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).
Information System on Brazilian Biodiversity (SIBBr)	Plant, animal and microrgnanisms	Information on Brazilian biodiversity, biological collections, biodiversity and health, uses and conservation efforts. 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.
Portal Alelo	Plant, animal and	Portal for services and management of data and information on Genetic Resources in Brazil. Contains passport data, statistics, characterization and evaluation of

	microrgnanisms	materials kept in germplasm banks. (http://alelobag.cenargen.embrapa.br/AleloConsultas/Conservacao/capacidade.do).
Portal of Biodiversity	Plant and animal	In order to provide information on Brazilian biodiversity (https: //portaldabiodiversidade.icmbio.gov.br/portal/).
Sistema de Autorização e Informação em Biodiversidade (SISBIO)	Research with plants and animals of Brazilian biodiversity, and access to traditional knowledge associated with	Remote access system that allows researchers to request authorizations to collect biological material and to perform research in federal conservation units and caves (http://www.icmbio.gov.br/sisbio/saiba-mais.html)

[*Insert rows as needed*]

76. Has your country established information systems intended to support maintenance of traditional knowledge on biodiversity for food and agriculture, including associated biodiversity? If yes, describe these and include information where available on socio-economic, policy and collective action aspects.

- **SisGen** - National System for Management of Genetic Heritage and Traditional Associated Knowledge - is an electronic system created as an instrument to assist the Genetic Heritage Management Council - CGen - in the management of genetic heritage and associated traditional knowledge. It started its operations in November, 2017 (http://www.mma.gov.br/patrimonio-genetico/conselho-de-gestao-do-patrimonio-genetico/sis-gen). Among the planned activities, the system allows:
  - To register access to the genetic heritage or associated traditional knowledge;
  - To register sending a sample from genetic heritage to provide services abroad;
  - Referral of sample of genetic heritage;
  - Notify finished product or reproductive material;
  - Request permission to access the genetic heritage or associated traditional knowledge and to send abroad with the consent of the National Defense Council and the Navy Command;
  - To request accreditation of institutions that maintain *ex situ* collections that contain samples of geneticheritage;
  - Obtain vouchers of access records, shipping and notification records;
  - Obtain certificates from the administrative verification procedure; and
  - Request attestations of regularity of access.

Stakeholder participation and ongoing activities that support maintenance of biodiversity for food and agriculture

77. List the most important stakeholder groups, including groups or associations of farmers, forest dwellers, fisher folk and pastoralists, NGOs or other civil society organizations active in the conservation of biodiversity for food and agriculture. Briefly summarize their scope, objectives and activities and any outcomes to date. Where possible provide examples of best practices or lessons learned.

- **Seed Network of the Cerrado:** non-profit association, with the objective of defense, preservation, conservation, management, recovery, promotion of studies and research,

and the dissemination of technical and scientific information related to the environment of the Cerrado, especially in Central Brazil (http://www.rsc.org.br).

- **Institute Society, Population and Nature:** It is an independent research and documentation center, non-profit, whose main objective is to contribute to the viability of sustainable development with greater social equity and environmental equilibrium (http://www.ispn.org. br).

- **Pro-UC Network:** Non-governmental organization, which works in partnership with other organizations and individuals, in the protection, strengthening, enhancement and expansion of all Nature Conservation Units in Brazil, especially those of Integral Protection (http: // redeprouc. org.br).

- **SOS Mata Atlantica Foundation:** Non-governmental organization that acts in the conservation of the Atlantic Forest and associated coastal and marine environments, seeking sustainable development and quality of human life (www.sosma.org.br).

- **Confederation of Agriculture and Livestock of Brazil:** Through the Biomas Project, developed in partnership with the Brazilian Agricultural Research Corporation (Embrapa), it studies and implements actions in the six Brazilian biomes to enable solutions with trees for protection, recovery and sustainable use of rural properties in the different biomes (http://www.cnabrasil.org.br/servicos-para-produtor/projetos-programas/projeto-biomas).

- **Pro-Nature Foundation (Funatura):** A non-profit organization that acts in the conservation and maintenance of biological diversity in Brazil, focusing on improving the quality of life of the population and contributing to the sustainable use of natural resources in all regions, especially in the Cerrado and Pantanal biomes (http://www.funatura.org.br/).

78. Describe any incentives or benefits to support activities for the conservation and sustainable use of biodiversity for food and agriculture or associated biodiversity (such as payments, provision of inputs, subsidies or other forms of incentives/ benefits). Briefly describe how these have been applied, to what extent and the stakeholders involved (including provisions on gender balance if any). Indicate any lessons learned and planned development incentives.

- **Bolsa Verde Program:** Its target audience is 16.2 million people living in extreme poverty who carry out activities for the conservation of natural resources in rural areas, priority conservation units for sustainable use and in resettlement projects for Agrarian Reform. By 2014 the program had reached 73,000 families. According to government estimates, there are 213,000 families living on 145 million hectares of priority areas targeted by the program. If the program were to reach all families, that would represent an investment of $ 80 million per year, or just $ 0.52 per hectare per year, which would be a low price to pay for conserving natural resources along with social and economic benefits. However, the operationalization of the program is still complex, and the location of the central coordination in Brasilia, far from the beneficiaries, increases the complexity of the operation. Decentralization of operations to the regions or states could contribute to the speed of program implementation and reduce the gap between the target population and program coordination.

- **Tax incentives for local governments (Ecological ICMS):** Municipalities that meet ecological criteria established by the state, such as the presence of conservation units and / or indigenous lands within their territories, solid waste management, sewage treatment systems, other criteria, may receive an additional share of the state tax collection on the circulation of goods and services. This incentive raises the budget of municipalities and gives opportunity for investment in education, health and solid waste management. However, adjustments are necessary for this money to be invested as it really needs more concrete results. As Ecological ICMS is not necessarily linked to environmental investments, municipal governments invest this resource according to their own criteria and not necessarily in environmental management or the creation of new conservation units.

- **Minimum Price Guarantee Policy for Socio-biodiversity Products (PGPM-Bio):** It supports the commercialization of non-timber forest products, with the payment of a direct subsidy, guaranteeing a minimum price for 15 native products, among which: açaí, andiroba, babaçu, baru, extractive rubber, extractive cacao, brazil nuts, carnauba, juçara, macaúba, mangaba, pequi, piaçava, pinhão and umbu. Created with the objective of attending to the traditional communities, generating income and opportunizing the conservation of the environment, and for this, it should be expanded. In 2015, the value of non-timber extraction in Brazil was approximately $ 460 million, and the products that stood out were: açaí ($ 147 million), native herb-mate ($ 121 million), almonds ($ 33 million), Brazil nut ($ 32.9 million), piaçava fibers ($ 31 million) and carnauba powder ($ 60 million). Together, these products accounted for 91.4% of the total value of non-timber plant extractive production in Brazil.

- **Food Acquisition Program:** Its objective is to collaborate with the fight against hunger and poverty in Brazil and, at the same time, to strengthen family farming. The program uses marketing mechanisms that favor the direct acquisition of products from family farmers or their organizations, stimulating the aggregation of value to production. The program serves family farmers, settled agrarian reform, indigenous communities and other traditional peoples and communities. In the year 2016, the federal government invested $ 123 million in food purchases through this program, serving 76,847 families and moving approximately 134 thousand tons of food destined to the formation of strategic stocks and distribution to the population in situation of social vulnerability. The results have been important in promoting the sustainable use of biodiversity, contributing to the formalization of the commercialization of socio-biodiversity products, also promoting the rupture of economic exploitation and monopoly relations practiced by local buyers and middlemen.

- **Seguro Defeso:** It is a modality of unemployment insurance with the socio-environmental objective of providing financial support to artisanal fishermen who are unable to work during the period of reproduction of native species, in order to protect marine, river and lake species from various regions of the country. has grown in the last five years and now serves 861 thousand families of artisanal fishermen, with an approximate investment of $ 675 million per year. The main challenge is to adapt the policy to the new economic reality of the country to continue the pace of formalization of the activity and increasing the number of beneficiaries.

- **Low Carbon Agriculture (ABC Plan):** Its purpose is to organize and plan the actions to be taken for the adoption of sustainable production technologies aimed at reducing GHG emissions by agricultural activities in Brazil. To date, the implementation of the actions

has shown that most of the pasture recovery is concentrated in the cerrado regions of the Northeast, where the highest percentage of degraded pastures is located, but with a higher percentage of areas undergoing recovery, with 9.6 million hectares. The North Region, where the Amazon biome is concentrated, would have about 570 thousand hectares of reclaimed pastures, a value considered small for the Region and where greater effort is needed. The Southeast and South regions had the highest levels of adoption of the resources destined for pasture recovery, being responsible for the recovery of 9.1 million hectares of pasture. However, the partial evaluation of the Plan (September 2017) indicates that the distribution of goals and resources is highly dependent on the policy implementation strategy. Without prioritization criteria, resources are more absorbed by the regions with greater aptitude and tradition in the operationalization of credit and in the adoption of technologies and, consequently, with better results than other regions. It is observed that the priority areas, from the point of view of pasture productivity, received less volume of resources and, consequently, resulted in a lower level of improvement in the use of the natural resource.

- **Renewable Energy and Environmental Sustainability Investment Facility (Pronaf Eco):** The National Program for Strengthening Family Agriculture (Pronaf) finances individual or collective projects that generate income for family farmers and settlers of agrarian reform. The program has several lines of credit that support the use and conservation of biodiversity, such as Pronaf Eco, which finances investments in techniques that minimize the impact of rural activity on the environment, allowing the farmer to better coexist with the biome in which his property is inserted.

- **Valuation of Protected Areas:** A study started in 2011 to evaluate and disseminate the role of conservation units in the provision of environmental goods and services that contribute to the economic and social development of the country. The current impact and economic potential of five environmental goods and services were evaluated: forest products, public use, carbon sequestration, water, and tax benefits. The study also evaluated the economic potential of two forest products (Brazil wood and Brazil nuts) in conservation units of the Amazon biome and estimated economic potential ranging from US $ 700 million to US $ 1.23 billion annually, as well as contributing to reduce demand illegal timber products.

79. List up to 10 major projects (either in progress or completed in the last five years) that support the conservation and sustainable use of biodiversity for food and agriculture, associated biodiversity and/or wild foods. For each project listed describe the components of biodiversity, the production system and area covered, and the results, outcomes and lessons learned. Projects described in sector reports need not be described here.

Project Mainstreaming Biodiversity Conservation and Sustainable Use into NTFP and AFS production practices in Multiple-Use Forest Landscapes of High Conservation Value (Projeto Bem Diverso)- The project´s objective is 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 agro-forestry systems (AFS). It will support Brazil’s goal of promoting the conservation and sustainable use of biodiversity while reducing poverty and increasing resilience in the rural areas, which are governmental objectives stated in public policies and programs. The project will conserve biodiversity in key forest landscapes - Amazon, Caatinga and Cerrado - all renowned for their outstanding global biodiversity significance but currently under threat from increasing land use pressures across production landscapes. It will address one of the key land use threats to these

forests, which is forest degradation driven by small-scale farmers that employ traditional subsistence farming and extraction practices in and around forested areas throughout the landscape, including land clearing, over-exploitation of resources, and poor fire management. This is causing increased encroachment on forest habitats both in areas under conservation and in locations that are strategic for connectivity across the landscape with the result of gradual loss of the global environmental values in these areas. It will seek to facilitate a shift from these unsustainable agricultural practices to an approach that conserves the biodiversity of multiple-use forest landscapes of high conservation value while meeting important social priorities and development goals. The project will therefore focus on the development of a strengthened sustainable use management framework for sustainable NTFP and AFS production. This will be achieved through two Outcomes: 1) Governance and capacity building framework for up-scaling best practices for BD sustainable management and production, and 2) Market and financial frameworks for up-scaling for NTFP and AFS production in high-conservation value forest landscapes. By removing current risks and uncertainties, the project will contribute to the upscaling of sustainable NTFP and AFS production while at the same time enhancing the rights and roles of communities in the sustainable management of BD and improving their livelihoods. Up-scaling and integration of AFS production will provide more environmentally friendly forms of land use in a landscape-level mosaic, increasing connectivity of forest fragments and helping to maintain ecosystem services.

80. List in Table 28 up to 10 major landscape based initiatives to protect or recognize areas of land and water in your country of particular significance for biodiversity for food and agriculture.

Table 28. Landscape based initiatives to protect or recognize areas of land and water in the country with particular significance for biodiversity for food and agriculture.

Landscape based initiatives[36]	**Description of sites and their characteristics of relevance to biodiversity for food and agriculture**	**Extent (area)**
Protected Marine and Coastal Areas Project	The main objective is to support the creation and implementation of a representative and effective system of marine and coastal protected areas to reduce biodiversity loss. The idea is to increase the protected area of the marine biome to 5% by 2019	175 thousand km^2
Areas Important to the Conservation of Birds Project	Global initiative to identify and protect a Brazilian network as well as worldwide critical areas for bird conservation	273 areas identified in Brazil (8.5 million ha in the Atlantic Forest and 7.3 million ha in Amazonia)
Program of Priority Areas of Amazonia	Federal government action with the objective of protecting areas of the Brazilian Amazon	60 million hectares
Ecological Corridors Project	Especially the biomes Amazon and Atlantic Forest. Its	NK

[36] For example, International Partnership for the Satoyama Initiative (IPSI) designated areas; Globally Important Agricultural Systems (GIAHS) designated areas; Identified buffer zones around UNESCO Man and Biosphere reserves; Indigenous and Community Conserved Areas; Indigenous and Community Conserved Areas; IUCN Category V (Protected Landscape/Seascape); High Nature Value grasslands, Ramsar Wetlands of International Importance, UNESCO World Heritage Sites (Natural, Mixed Natural Cultural), UNESCO World Heritage Forests, Conservation forests, etc.

	function is the protection of nature, reducing or preventing the fragmentation of existing forests, through the connection between different modalities of protected areas and other spaces with different uses of the soil	
Sustainable Landscapes of Amazonia - Brazil	It is part of the regional conservation program of the Amazon, involving Brazil, Colombia and Peru. Provide sustainability of protected area systems; Reduce threats to biodiversity; Recover degraded areas; Increase carbon stock; Develop good forest management practices; Strengthen policies and plans for conservation and recovery	NK
Wetland Conservation Project (Ramsar)	It is part of the Convention on Wetlands of International Importance (Ramsar Convention). It aims to promote the conservation and rational use of wetlands in the world, considering the ecological importance and social, economic, cultural, scientific and recreational value of such areas to the human communities that depend on them.	22 areas recognized in Brazil until 2017

[*Insert rows as needed*]

Collaboration between institutions and organizations

81. Describe existing linkages and collaboration between sectors in national programmes and policies governing conservation and sustainable use of biodiversity for food and agriculture. These may include overall strategies and plans developed by your country, committees or other national bodies which oversee or support collaboration, shared actions, facilities or resources and specific activities which involve inter-sector collaboration.

- Brazilian Sociobiodiversity Native Food Species of Nutritional Value - Ordinance Nº 163 (11 March 2016). Sixty-four of the BFN Project's prioritized species appear on the list. These are the species which the BFN Project in Brazil is focusing on to improve the evidence base for their nutritional value with a view to integrating into relevant national policies and programmes.
- These species will now be more attractive for family farmers not only to grow and conserve them, but also to use and commercialize, since they now have greater recognition by the federal institutions partners of the BFN Project, especially the Food Procurement Programme (PAA), the National School Feeding Programme (PNAE) and the Minimum Price Guarantee Policy on Biodiversity Products (PGPM-Bio).

82. How are ministries working together to meet Aichi Targets[37] as they may apply to the conservation and sustainable use of biodiversity for food and agriculture in your country?

The Federal Multiyear Plan (PPA), developed every four years by the federal government with the collaboration of all sectors, contains all the programs and activities in progress or planned for a given period of four years. In this plan it is possible to identify the national public policies that contribute to reverse the causes of the loss of biodiversity, aiming at the achievement of the Aichi Biodiversity Targets.

[37] http://www.cbd.int/sp/targets/

The Multi-Year Plan (2016-2019) included integrated actions among all Ministries and several federal agencies. The first PPA assessment (2016-2019) presents 19 direct indicators on the conservation and use of biodiversity. Some of them showed great advances compared to 2014: the number of Producers inserted in the Rural Environmental Register went from 53.56% to 100% in 2016; increases were observed in the percentages of vegetation coverage in Agrarian Reform Settlements and in Federal Conservation Units benefited by the Bolsa Verde Program; 2% of the wild fauna presented lower risk of extinction; 12.8% of the flora species have Plans of Action for recovery and conservation, were only 4% in 2014.

Some examples of existing initiatives and actions that contribute significantly to integrating biodiversity conservation into other sectors as well as to developing joint intersectoral initiatives would be: the Ecological-Economic Zoning that determines the best use of the soil; the Natural Capital Initiative of Brazil; the Action Plan for the Prevention and Control of Deforestation in the Amazon (PPCDAm) and the Plan of Action for the Prevention and Control of Deforestation and Burnings in the Cerrado (PPCerrado) for the monitoring and control of fires; among many others, including the use of public events to advance the biodiversity agenda.

Additionally, various efforts are being conducted by the Ministry of Environment, Ministry of Agriculture, Livestock and Supply and other government agencies and nongovernmental and private sector agencies to generate and disseminate knowledge about biodiversity and its value, such as the Initiative Natural Capital of Brazil, in order to contribute to the promotion and improvement of biodiversity integration in sectoral policies and programs, as well as to a better understanding of the importance and value of biodiversity and ecosystem services, and their conservation and sustainable use.

83. What future actions have been planned to support your country's efforts in addressing Aichi Targets as they may apply to the conservation and sustainable use of biodiversity for food and agriculture in your country?

84. Is your country involved in the implementation of regional and/or international initiatives targeting the conservation and sustainable use of associated biodiversity? List initiatives in Table 29.

Table 29. Regional and/or international initiatives targeting the conservation and sustainable use of associated biodiversity.

Initiatives	**Scope (R: regional, I: international)**	**Description**	**References**
Amazon Sustainable Landscape Program (PSAM)	R	A program that involves Brazil, Colombia and Peru. Its main focus is the creation and consolidation of protected areas, the conservation of landscapes through the development of sustainable agricultural practices within and between protected areas, the strengthening of Policies for the monitoring and recovery of degraded areas and the exchange of knowledge among the countries	https://www.thegef.org/project/amazon-sustainable-landscapes-program

		involved.	

[*Insert rows as needed*]

Capacity development

85. What training and extension programmes, or elements of programmes, at all levels, exist that target the conservation and sustainable use of associated biodiversity?

- National Register of Local, Traditional and Creole Cultivars, created to support the use, management and conservation of local, traditional and native cultivars, in the context of the democratization policies of access to seeds, preservation of agrobiodiversity and adoption of agroecological practices (http://www.mda.gov.br/sitemda/cultivares-crioulas).

86. What higher education programmes exist that target the conservation and sustainable use of associated biodiversity genetic resources? List in Table 30 the institutions, as well as the programmes and enrolment, disaggregated by sex, if possible.

Table 30. Higher education programmes specifically targeting the conservation and sustainable use of associated biodiversity genetic resources in the country.

Institution	**Programme**	**Level**	**Enrolment**		
			Total	Male	Female
Anhanguera University of São Paulo	Biodiversity	Graduation	NK	NK	NK
Foundation University of the State of Santa Catarina	Biodiversity	Graduation	20	NK	NK
Federal University of Latin American Integration	Ecology and biodiversity	Graduation	50	NK	NK
Federal University of Latin American Integration	Neotropical biodiversity	Postgraduate	NK	NK	NK
Faculty Entre Rios of Piauí	Biodiversity	Specialization	280	NK	NK
Faculty Center South of Paraná	Ecology and biodiversity	Specialization	12	NK	NK
Central Faculty of Cristalina	Environmental education and biodiversity	Specialization	18	NK	NK
Integrated School of Araguatins	Environmental management, biodiversity, and biology	Specialization	50	NK	NK
Integrated School of Ipiranga	Environmental management, biodiversity, and biology	Specialization	200	NK	NK
Faculty Promove of Janaúba	Environmental management, biodiversity, and sustainable development	Specialization	10	NK	NK
Federal University of Paraiba	Biodiversity	Post graduate	13	5	8
Federal University of São Paulo	Marine and coastal biodiversity and ecology	Post graduate	NK	NK	NK
Oswaldo Cruz Institute	Biodiversity and health	Post graduate	41	16	25
Federal University of Goiás	Plant biodiversity	Post graduate	13	7	6
Federal University of Rio de	Biodiversity and	Post graduate	NK	NK	NK

Janeiro	evolutionary biology				
Federal University of Santa Maria	Animal biodiversity	Post graduate	NK	NK	NK
Rede Bionorte	Biodiversity and biotechnology of the Legal Amazon	Post graduate	84	28	56
Federal University of Espirito Santo	Tropical biodiversity	Post graduate	27	10	17
Federal University of Pará	Biodiversity and conservation	Post graduate	29	10	19
State University of Maranhão	Biodiversity, environment, and health	Post graduate	NK	NK	NK
State University of Bahia	Plant biodiversity	Post graduate	19	4	15
Federal University of Tocantins	Biodiversity, ecology, and conservation	Post graduate	NK	NK	NK
Federal University of Maranhão	Biodiversity and conservation	Post graduate	9	4	5
Federal University of Mato Grosso	Ecology and conservation of biodiversity	Post graduate	23	18	5
State University of Southwest of Bahia	Genetics, biodiversity and conservation	Post graduate	NK	NK	NK
State University of São Paulo	Ecology and biodiversity	Post graduate	58	25	33
Federal University of Grande Dourados	Entomology and biodiversity conservation	Post graduate	86	37	49
Federal University of Sergipe	Agriculture and biodiversity	Post graduate	58	24	34
Museu Paraense Emilio Goeldi	Biodiversity and evolution	Post graduate	13	4	9
Federal University of Bahia	Animal biodiversity	Post graduate	22	12	10
Institute of Botany of São Paulo	Plant biodiversity and environment	Post graduate	22	11	11
Federal University of Pernambuco	Biodiversity and conservation	Post graduate	20	11	9
University of São Paulo	Systematics, animal taxonomy and biodiversity	Post graduate	46	13	33
Federal University of Western Pará	Biodiversity	Post graduate	8	3	5
University of Montes Claros	Biodiversity and use of genetic resources	Post graduate	41	14	27
Botanical Garden Research Institute of Rio de Janeiro	Plant biodiversity	Post graduate	85	36	49
Botanical Garden Research Institute of Rio de Janeiro	Biodiversity in Conservation Units	Post graduate	91	44	47
Federal University of Mato Grosso do Sul	Post Graduate Program in Plant Biology	Post graduate	43	21	22
National Institute of Amazonian Research	Genetics, Conservation, and Evolutionary Biology	Post graduate	62	29	33
University of Brasilia	Graduate Program in Botany	Post graduate	19	5	14
Federal University of Rio de Janeiro	Plant biology	Post graduate	15	9	6
Federal University of Campinas	Plant biology	Post graduate	NK	NK	NK
Federal University of Feira de Santana	Botany	Post graduate	NK	NK	NK

Federal University of Santa Cruz	Botany	Post graduate	15	5	10
State University Paulista "Júlio de Mesquita Filho"	Plant biology	Post graduate	NK	NK	NK
State University Paulista "Júlio de Mesquita Filho"	Botany	Post graduate	41	9	32
Federal University of Minas Gerais	Plant biology	Post graduate	47	18	29
Federal University of Santa Catarina	Biology of fungi, algae, and plants	Post graduate	25	8	17
Federal University of Uberlândia	Plant biology	Post graduate	12	3	9
Federal University of Viçosa	Botany	Post graduate	53	27	26
Federal University of Paraná	Botany	Post graduate	27	12	15
Federal University of Rio de Janeiro	Biological Sciences	Post graduate	52	22	30
Federal University of Rio Grande do Sul	Botany	Post graduate	69	27	42
Federal Rural University of Amazônia	Biological Sciences	Post graduate	46	21	25
Federal Rural University of Pernambuco	Botany	Post graduate	62	27	35

Source: Ministry of Education (http://emec.mec.gov.br; https://sucupira.capes.gov.br). Considering only the courses in activity in 2017 and with graduates.

Note: Data marked with NK (no knowledge) does not necessarily mean absence of data, but only that information that is readily available was not found.

Knowledge generation and science for the management and sustainable use of biodiversity for food and agriculture

87. List up to 10 major institutions within your country directly involved in research on the conservation and sustainable use of associated biodiversity. Provide a concise description of the institutions, of their key research programmes and, where possible, provide the number of active researchers.

- **Embrapa Genetic Resources and Biotechnology:** it has 306 employees working in the exchange and quarantine of plant germplasm, guaranteeing the continuity of the breeding programs of Embrapa, besides preventing the introduction and dispersion of agricultural pests. The material introduced and collected in the Country is classified and kept at -20 C, constituting the Long-Term Collection, known as Colbase, which currently has more than 100,000 accesses. The conservation actions are complemented by cryopreservation, in vitro conservation, in situ and on farm "in order to safeguard the genetic resources and the traditional knowledge contained therein. It operates in the following research and development areas: in situ and ex situ conservation; wild relatives and native plant species, characterization of plant genetic resources, conservation and characterization of animal genetic resources, biology of animal development and reproduction, plant development and reproduction, biotechnology, synthetic biology and bioinformatics, bioactive substances and nanomaterials, biological pest control, quarantine and plant health (https://www.embrapa.br/recursos-geneticos-e-biotecnologia).

- **Foundation Botanical Garden Institute of Rio de Janeiro:** Research in several areas of botany (taxonomy, anatomy, morphology, physiology, biogeography, phytogeography, ecology and conservation), as well as in history of science, phytopathology and other

topics. It currently has 42 researchers, as well as a team of technologists, laboratory technicians and support staff. A large number of undergraduate, postgraduate and postdoctoral fellows, usually linked to projects with extra resources, also work in scientific activities (http://dipeq.jbrj.gov.br/).

- **Museu Paraense Emilio Goeldi:** Institution of research linked to the Ministry of Science and Technology and Innovation. Located in the city of Belém, State of Pará, Amazon region, founded in 1866 and concentrating scientific studies of the natural and sociocultural systems of the Amazon, as well as the dissemination of knowledge and collections related to the region. It currently has 70 researchers, distributed in four major areas: Botany, Zoology, Earth Sciences and Ecology and Human Sciences (Anthropology, Archeology and Indigenous Linguistics). Scientific collections hold approximately 4.5 million items of scientific and historical importance. The collections make the Goeldi Museum one of the three largest institutions holding scientific collections in Brazil, and the biological collections consist for the most part of records of the biodiversity of the Amazon region (http://www.museu-goeldi.br).

- **National Institute of Amazonian Research:** Created in 1952, it carries out scientific studies of the physical environment and living conditions of the Amazon region to promote human well-being and regional socio-economic development. Currently, INPA is a world reference in Tropical Biology and has 210 researchers. Initially focused on research, surveys and inventories of fauna and flora, today seeks to expand in a sustainable way the use of the natural resources of the Amazon. Develops research with focus on Environmental Dynamics; Society, Environment and Health; Technology and Innovation and Biodiversity (http://portal.inpa.gov.br).

- **Botanica Institute of São Paulo:** It is an institution of scientific research in the area of botany, of the Environment Department of the State of São Paulo. In addition to its headquarters, Biological Reserve and Botanic Garden, located within the State Park of the Fontes do Ipiranga, in the capital of the State of São Paulo, the Água Funda neighborhood has two other Conservation Units, representing the main biomes of the State: Atlantic Forest (Alto da Serra Biological Reserve of Paranapiacaba) and Cerrado (Biological Reserve and Experimental Station of Mogi Guaçu). He works in the research with focus on anatomy, briology, recovery of degraded areas, ecology, ficology, physiology and biochemistry, mycology, palynology and other related areas. It has two important collections: The Collection of Algae, Cyanobacteria, and Fungus Cultures; and the herbarium A. de Saint-Hilaire. Currently the Institute has some of the most renowned scientists in plant research in Brasilia, especially in taxonomy, developing works in partnership with the other institutes listed here (http://www3.ambiente.sp.gov.br/institutodebotanica).

- **Chico Mendes Institute for Biodiversity Conservation:** A municipality linked to the Ministry of the Environment and part of the National Environmental System (Sisnama). It is responsible for carrying out the actions of the National System of Conservation Units, and may propose, implement, manage, protect, supervise and monitor the UCs established by the Union. It is also responsible for promoting and executing biodiversity research, protection, preservation and conservation programs and exercise the power of environmental police for the protection of federal Conservation Units. It is the responsibility of the Institute to monitor the public use and economic exploitation of natural resources in Conservation Units where this is permitted, obeying the legal and environmental sustainability requirements. In the research area, it contributes to the

systematic generation and dissemination of information and knowledge related to the management of Conservation Units, the conservation of biodiversity and the use of fauna, fisheries and forestry resources; in addition to disseminating methodologies and technologies for environmental management and protection and integrated management of ecosystems and species of natural and genetic heritage of ecological representativeness at regional and national scale (http://www.icmbio.gov.br).

- **National Institute of Space Research:** Among other activities, it develops research and activities in the fields of Meteorological Sciences, Meteorology by Satellites, Weather Forecast and Climatology. It maintains close cooperation with the Ministry of the Environment and Chico Mendes Institute in research and teaching, especially in the areas of meteorology and remote sensing. Providing environmental monitoring data for the various biomes, as well as information on deforestation, natural disasters and geological data that allow strategic decisions (http://www.inpe.br).

- **Agronomic Institute of Campinas:** Research Institute of the Secretariat of Agriculture and Supply of the State of São Paulo, founded in 1887, and focuses on the areas of food, raw materials for industry, cooperating for food security and competitiveness of products in domestic and foreign markets. It has 161 researchers and 12 Research Centers distributed in the state of São Paulo. Among its activities is the Center for Plant Genetic Resources, which brings together reference laboratories to provide molecular diagnostic services, aggregation of value in plants for aromatic and medicinal use and creation of integrated research network to enable viability under competitive bases of plants with vocation for biodiesel. The Center develops research on sustainability, such as better use of water and soil nutrients, as well as phytoremediation technologies and genetic materials with tolerance to cold and heat. In its structure it also houses several collections of plant germplasm and a botanical garden (http://www.iac.sp.gov.br).

Gaps and priorities

88. With respect to information management, national policies, programmes and enabling frameworks that support or influence the conservation and sustainable use of biodiversity for food and agriculture and the provision of ecosystem services, and govern exchange, access and benefits:

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?

89. With respect to stakeholder participation and ongoing activities that support maintenance of biodiversity for food and agriculture and collaboration between institutions and organizations:

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?

90. With respect to capacity development:

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?

91. With respect to knowledge generation and science for the management and sustainable use of 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?

CHAPTER 6: Future agendas for conservation and sustainable use of biodiversity for food and agriculture

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

This chapter provides an opportunity to describe plans and priorities to secure and improve the conservation and sustainable use of biodiversity for food and agriculture. Particular attention should be given to future opportunities to enhance the contribution of biodiversity for food and agriculture to food security and nutrition, as well as the elimination of rural poverty. Planned actions and initiatives should be listed that intend to support the following:

- Strengthening the contribution of biodiversity for food and agriculture to secure the multiple benefits of agriculture, including food security and nutrition, rural development, sustainable intensification, and the enhanced sustainability and resilience of production systems;
- Improving recognition and involvement of farmers, pastoralists, fishers and forest dwellers, addressing gender equality, and supporting the roles and contributions of women;
- Contributing to the UN Strategic Plan for Biodiversity and to achieving the Aichi Targets[38] and linking to other related processes undertaken through the Convention on Biological Diversity.

Additionally, Chapter 6 allows an assessment of future needs with respect to policies and legal arrangements, economic frameworks, knowledge creation, capacity development and collaboration.

This part of the Country Report should build on the results presented in earlier Chapters and provide an integrated overview with, where possible, clear priorities for national, regional or global actions. This chapter is structured to benefit countries through an overall synthesis of information provided elsewhere in the report. Countries that previously presented or are currently preparing a Country Report on Forest, Aquatic, Animal or Plant Genetic Resources, may wish to take full advantage of their different sectoral reports to identify an overall perspective.

[38] Especially Targets 6, 7, 13.

Enhancing the contribution of biodiversity for food and agriculture

This section provides an opportunity for countries to highlight their plans and priorities, and to describe current constraints to achieving them on enhancing the contribution of biodiversity for food and agriculture to human wellbeing, environmental health and sustainable production. Include any information that might be useful in informing future policies to help strengthen the contribution of biodiversity for food and agriculture to the broader sustainability and development objectives listed below.

92. Describe planned actions and future priorities to improve the conservation and sustainable use of biodiversity for food and agriculture with specific reference to enhancing its contribution to:

a) improving food security and nutrition;
b) improving rural livelihoods;
c) improving productivity;
d) supporting ecosystem function and the provision of ecosystem services;
e) improving the sustainability and resilience of production systems;
f) supporting sustainable intensification.

Refer to the future needs and priorities identified in previous Chapters. The different topics may be dealt with jointly or individually as appropriate to country plans and approaches. Replies should include country perspectives on:

- **Ways and means of improving the capacity and operations of the institutions within your country concerned with or affected by the maintenance and use of biodiversity for food and agriculture and particularly of associated biodiversity, including universities, government programmes, NGOs, breeders, private sector entities, organizations and social movements of small-scale producers. Actions to improve collaboration between stakeholders should be included.**

- **Ways and means of supporting the development of new policies or the implementation of the current policies that support the integrated conservation and sustainable use of biodiversity for food and agriculture, and that also specifically target associated biodiversity.**

- **The major information and knowledge gaps that remain to be addressed and options that exist to address them.**

Countries should indicate the ways in which planned actions will contribute to the UN Strategic Plan for Biodiversity and to achieving the Aichi Targets[39] as well as to how they link to other related processes undertaken through the Convention on Biological Diversity.

Strengthening the conservation and management of associated biodiversity and wild foods

[39] In particular Targets 6, 7, 13.

This section provides an opportunity for countries to highlight their plans and priorities, and to describe current constraints to achieving them on the conservation and management of associated biodiversity and of wild foods.

93. Describe planned actions and future priorities to support conservation and management of the components of associated biodiversity and wild foods including the development of monitoring programmes and of information systems or databases.

Replies should cover country perspectives on:

- **Ways and means of improving the capacity and operations of the institutions within your country concerned with or affected by the maintenance and use of biodiversity for food and agriculture and particularly of associated biodiversity, including universities, government programmes, NGOs, breeders, private sector entities, organizations and social movements of small-scale producers. Actions to improve collaboration between stakeholders should be included;**

- **Ways and means of supporting the development of new policies or the implementation of the current policies that support the integrated conservation and sustainable use of biodiversity for food and agriculture, and that also specifically target associated biodiversity;**

- **The major information and knowledge gaps that remain to be addressed and options that exist to address them.**

94. Describe planned actions and future priorities with respect to implementing ecosystem approaches for the various components of biodiversity for food and agriculture.

Improving stakeholder involvement and awareness

This section provides an opportunity for countries to highlight their plans and priorities, and to describe current constraints to achieving them with respect to stakeholder involvement in the conservation and sustainable use of biodiversity for food and agriculture with specific reference to the recognition and involvement of farmers, pastoralists, fishers and forest dwellers, addressing gender equality, and supporting the roles and contributions of women.

95. Describe planned actions and future priorities to improve stakeholder awareness, involvement and collaboration in the conservation and sustainable use of biodiversity for food and agriculture. Include a description of the major challenges that will need to be overcome.

- The area needing the most attention is production and marketing (supply) of wild foods. Priority should be given to marketing opportunities that could be explored by promoting social entrepreneurial at the grassroots level, at the private sector level or by strengthening links with institutional markets.

96. Describe planned actions and future priorities to support the role of farmers, pastoralists, fisher folk, forest dwellers, and other rural men and women dependent on

local ecosystems in the conservation and use of biodiversity for food and agriculture. Replies should include information on recognizing and enhancing the role of indigenous peoples. Include a description of the major challenges that will need to be overcome.

- Formulation and implementation of training programs on ABS as well as Community Protocols and for multipliers;
- Strengthen activities of production chains with access to genetic resources and associated traditional knowledge and capacity building in ABS;
- Women's practices and knowledge should be recognized and valued.

97. Describe planned actions and future priorities to improve recognition of the contribution of women to the conservation and use of the different components of biodiversity for food and agriculture, including associated biodiversity. Include a description of the major challenges that will need to be overcome.

ANNEX 1: Recommended scope of the Country Report

Biodiversity for food and agriculture

Biodiversity for food and agriculture includes the variety and variability of animals, plants and micro-organisms at the genetic, species and ecosystem levels that sustain the ecosystem structures, functions and processes in and around production systems, and that provide food and non-food agriculture products. Production systems, as defined for the purposes of this report, include the livestock, crop, fisheries and aquaculture and forest sectors. The diversity found in and around production systems has been managed or influenced by farmers, pastoralists, forest dwellers and fisherfolk over many hundreds of generations and reflects the diversity of both human activities and natural processes.

The present Guidelines for the SoWBFA mainly focus on those areas not covered by completed or on-going Country Reports on Animal, Forest, Plant and Aquatic Genetic Resources, 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, and wild resources used for food.

Associated biodiversity

For the scope of this report, associated biodiversity comprises those species of importance to ecosystem function, for example, through pollination, control of plant, animal and aquatic pests, soil formation and health, water provision and quality, etc., including *inter alia*:

a) Micro-organisms (including bacteria, viruses and protists) and fungi in and around production systems of importance to use and production such as mycorrhizal fungi, soil microbes, planktonic microbes, and rumen microbes;

b) Invertebrates, including insects, spiders, worms, and all other invertebrates that are of importance to crop, animal, fish and forest production in different ways, including as decomposers, pests, pollinators, and predators, in and around production systems;

c) Vertebrates, including amphibians, reptiles, and wild (non-domesticated) birds and mammals, including wild relatives, of importance to crop, animal, fish and forest production as pests, predators, pollinators or in other ways, in and around production systems;

d) Wild and cultivated terrestrial and aquatic plants other than crops and crop wild relatives, in and around production areas such as hedge plants, weeds, and species present in riparian corridors, rivers, lakes and coastal marine waters that contribute indirectly to production.

Note that domesticated species may also provide ecosystem services other than provisioning ones and affect crop, animal, fish and forest production in different ways. However since these species are already addressed in other State of the World Reports, countries may choose whether or not they want to include them in their Country Reports for the SoWBFA.

Integrated analysis of biodiversity for food and agriculture

The scope of the Report builds upon the contribution of individual sector reports by providing an integrative analysis of interactions, including synergies, interlinkages and trade-offs, between genetic resources of the different sectors. This is achieved through the identification of production systems within the country (Annex 2), and particular focus upon ecosystem perspectives in relation to biodiversity for food and agriculture. Questions addressing overall biodiversity for food and agriculture target information that would build upon what may be available in previous or ongoing country reports.

ANNEX 2: Production systems

Table 1. Climatic zones definitions

Climatic zone	Definition
Tropics	All months with monthly mean temperature, corrected to sea level, above 18°C.
Subtropics	One or more months with monthly mean temperatures, corrected to sea level, below 18°C but above 5 °C.
Temperate	At least one month with monthly mean temperatures, corrected to sea level, below 5 °C and four or more months above 10 °C.
Boreal	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.

Table 2. Production systems descriptions

Name of production system	Climatic zone	Description
Livestock grassland-based systems	Tropics Subtropics Temperate Boreal and /or highlands[40]	Systems in which the animals obtain a large proportion of their forage intake by grazing natural or sown pastures, includes: • Ranching: grassland-based systems in which livestock is kept on privately owned rangeland • Pastoralist: grassland-based systems in which the livestock keepers move with their herds or flocks in an opportunistic way on communal land to find feed and water for their animals (either from or not from a fixed home base)
Livestock landless systems	Tropics Subtropics Temperate Boreal and /or highlands	Systems in which livestock production is separated from the land where the feed given to the animals is produced.
		•
Naturally regenerated forests	Tropics Subtropics Temperate Boreal Boreal and /or highlands	Includes: • Primary: Forests of native species, where there are no clearly visible indications of human activities and the ecological processes are not directly disturbed by humans • modified natural: Forests of naturally regenerated native species where there are clearly visible indications of significant human activities • semi-natural (assisted natural regeneration): Silvicultural practices in natural forest by intensive management (weeding, fertilizing, thinning, selective logging)
Planted forests	Tropics Subtropics	Includes : • semi-natural (planted component) : Forests of native species, established through planting or seeding, intensively managed

[40] High elevation montane environments where climate differs significantly from surrounding lower elevation areas, including alpine and sub-alpine zones, tropical highlands, dryland mountains, etc.

	Temperate	• Plantations (productive) : Forests of introduced and/or native species established through planting or seeding mainly for production of wood or non-wood goods • Plantations (protective) : Forests of introduced and/or native species, established through planting or seeding mainly for provision of services
	Boreal	
	Boreal and /or highlands	
Self-recruiting capture fisheries	Tropics	Includes capture fisheries in marine, coastal and inland areas that can involve • Natural ecosystems • Modified ecosystems e.g. reservoirs and rice paddies;
	Subtropics	
	Temperate	
	Boreal	
Culture-based fisheries	Tropics	Fisheries on resources, the recruitment of which originates or is supplemented from cultured stocks (i.e., populations chosen for culture and not stocks in the same sense as that term is used for capture fisheries) raising total production beyond the level sustainable through natural processes.
	Subtropics	
	Temperate	
	Boreal and /or highlands	
Fed aquaculture	Tropics	The farming of aquatic organisms including fish, mollusks, crustaceans, aquatic plants, crocodiles, alligators, turtles and amphibians. Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators etc. Farming also implies individual or corporate ownership of the stock being cultivated; i.e., the population chosen for culture and not a stock in the same sense as that term is used for capture fisheries. Fed aquaculture production utilizes or has the potential to utilize aquafeeds of any type in contrast with the farming of filter-feeding invertebrates and aquatic plants that relies exclusively on natural productivity. Also defined as “farming of aquatic organisms utilizing aquafeeds in contrast to that deriving nutrition directly from nature”.
	Subtropics	
	Temperate	
	Boreal and /or highlands	
Non-Fed aquaculture	Tropics	The farming of aquatic organisms including fish, mollusks, crustaceans, aquatic plants that do not need supplemental feeding. Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators etc. Farming also implies individual or corporate ownership of the stock being cultivated; i.e., the population chosen for culture and not a stock in the same sense as that term is used for capture fisheries. In non-fed aquaculture systems culture is predominately dependent on the natural environment for food, e.g. aquatic plants and mollusks.
	Subtropics	
	Temperate	
	Boreal and /or highlands	
Irrigated crops (rice)	Tropics	Irrigated rice refers to areas where rice is cultivated purposely provided with water, including land irrigated by controlled flooding.
	Subtropics	
	Temperate	
	Boreal and /or highlands	
Irrigated crops (other)	Tropics	Irrigated crops other than rice refers to agricultural areas purposely provided with water, including land irrigated by controlled flooding.
	Subtropics	
	Temperate	
	Boreal and /or highlands	
Rainfed crops	Tropics	Agricultural practice relying exclusively on rainfall as its source of

	Subtropics	water.
	Temperate	
	Boreal and /or highlands	
Mixed production systems (livestock, crop, forest and /or aquatic and fisheries mixed)	Tropics	Production systems with multiple components. They include: • Crop-livestock: mixed systems in which livestock production is integrated with crop production. • Agro-pastoralist: livestock-oriented systems that involve some crop production in addition to keeping grazing livestock on rangelands; they may involve migration with the livestock away from the cropland for part of the year; in some areas, agropastoral systems emerged from pastoral systems • Agroforestry-livestock: mixed system in which livestock production is integrated with the production of trees and shrubs[38] • Integrated aquaculture: mixed systems in which aquaculture is integrated with crop and livestock production. May involve ponds on farms, flooded fields, enrichment of ponds with organic waste, etc. • Other combinations

ANNEX 3: Drivers of change

Table 1. Drivers of change and descriptions.

Drivers	Description, Subcategories and Examples
Changes in land and water use and management	A change in the use, management and practices around land and water (e.g., deforestation; fragmentation; modification of water regimes; forest degradation; land conversion for agriculture; ecosystem restoration; the role of women and men in land and water use and management, etc.)
Pollution and external inputs	The mismanaged, excessive or inappropriate use of external inputs (e.g., over application of fertilizer and pesticides; excessive use of antibiotics or hormones; nutrient loading, including from use of imported feed; ocean acidification, CO_2 fertilization; chemical and particulate pollutants, etc.
Over-exploitation and overharvesting	Unsustainable extraction practices (e.g., overfishing; overhunting; overgrazing; logging and extractive activities exceeding replacement rates or affecting species of uncertain and at-risk conservation status, etc.)
Climate change	The impacts and effects of progressive climate change (e.g., alterations in precipitation regimes; temperature changes; loss of water supply; increased variability; sea level rise; shifts in flowering time or seasonality, etc.)
Natural disasters	Climate shocks, extreme weather events and other natural disasters that threaten agricultural production and resilience of production systems (e.g., hurricanes, earthquakes, floods, fires).
Pests, diseases, alien invasive species	New and emerging threats from pests, diseases and invasive species affecting biodiversity for food and agriculture (e.g., shifting ranges; introductions; increased suitability; loss of predator, etc.)
Markets, trade and the private sector	**Trade-** Changing terms of trade, globalization of markets, commercialization of products, retailing, the separate capacities of women and women to commercialize products, etc. **Markets and consumption -** Demand driven changes in production or practices including the tastes, values or ethics of consumers that may impact directly or indirectly biodiversity for food and agriculture, product quantity or quality **Private sector -** The changing role and influence of private sector and corporate interests
Policies	**Policies** - Global, regional, national, and subnational legislation and regulations (e.g., conservation regulations, participation and compliance with International treaties and conventions); **Economic and policy interventions** - Interventions that impact biodiversity for food and agriculture directly or indirectly (e.g., taxes, subsidies, charges for resource use, payments for ecosystem services) **Intellectual Property Rights (IPR), Access and Benefit Sharing (ABS) -** Direct or indirect impacts of IPR and ABS policy and regulations on biodiversity for food and agriculture.
Population growth and urbanization	**Population** - Changes in population metrics (e.g., growth, fertility, composition, mortality, migration, health and disease, including different affects on men and women.) **Urbanization**- (e.g., shifts in proportion of urban and rural; change in urbanization trends, including different effects on men and women)
Changing economic, socio-political, and cultural factors	**Economic development** - A change in economic circumstances of countries, industries, households (e.g., change in GDP and economic growth; structural change of economy; income diversification, and the different economic circumstances of men and women.) **Changing socio-political, cultural or religious factors** - Variation in the forces influencing decision-making of men and women, e.g., public participation, shifts in the influence of the state vs. private sector, changes in levels of education and knowledge, shifts in the beliefs, values and norms held by a group of people.

	Participatory actions – the role of collective action toward conservation and use of biodiversity by stakeholders
Advancements and innovations in science and technology	The development and diffusion of scientific knowledge and technologies, (e.g., advances in breeding; improvements in mobile extension; tools for monitoring; biotechnology applications, access of men and women to information).

ANNEX 4: Ecosystem services

The SoWBFA Guidelines focus primarily on regulating and supporting ecosystem services, described below. Provisioning services relating to biodiversity for food and agriculture are the focus of sectoral State of the World Reports, and are addressed in these guidelines only in relation to associated biodiversity and wild foods, which often fall outside of traditional sectoral reporting. Countries may choose to address additional ecosystem services, including cultural services, for the completion of national reports, particularly where they are directly relevant to the objectives of the SoWBFA Report[41].

Table 1. Regulating and supporting ecosystem services.

Category	Ecosystem services	Description	Relevant ecosystem functions
Regulating services	Pollination	Role ecosystems play in transferring pollen from male to female flower parts	Agricultural productivity; production of food and goods.
	Pest and disease regulation	Influence ecosystems have on the prevalence of crop and livestock pests and diseases	Biological control; the maintenance and feedback mechanisms preventing outbreaks of pests and diseases, including invasive species.
	Water purification and waste treatment	Role ecosystems play in the filtration and decomposition of organic wastes and pollutants in water; assimilation and detoxification of compounds through soil and subsoil processes	Filtering function performed by vegetation cover, soil and aquatic biota.
	Natural hazard regulation	Capacity for ecosystems to ameliorate and reduce the damage caused by natural disasters	Vegetative structure can alter potentially catastrophic effects of storms, floods and droughts through its storage capacity and surface resistance; coral reefs buffer waves and protect adjacent coastlines from storm damage. The services provided by this function relate to providing safety of human life and human constructions.
Supporting services	Nutrient cycling	Flow of nutrients (e.g., nitrogen, sulfur, phosphorus, carbon) through ecosystems	Maintenance of fertility; regulation of excess nutrients; climate regulation; regulation of biotic communities
	Soil formation and protection	Degradation of ecosystems, such as decomposition of organisms or weathering of substrate, to form soil	Maintenance of crop productivity on cultivated lands and the integrity and functioning of natural ecosystems.
	Water cycling	Flow of water through ecosystems in its solid, liquid, or gaseous forms	Regulation of hydrological flows at the earth surface. Maintenance of natural irrigation and drainage, buffering of extremes in discharge of rivers, regulation of channel flow, and provision of a medium for

[41] Including those described in the Millennium Ecosystem Assessment, or subsequent adaptations by the TEEB or other sources.

			transportation.
	Habitat provisioning	Role of ecosystems in creating and maintaining habitats for a wide variety of organisms	Providing diverse and suitable habitats for species; nursery function for migratory species and as breeding areas.
	Production of oxygen/ Gas regulation	The creation of atmospheric oxygen through photosynthesis	Gas regulation functions include the maintenance of clean, breathable air, and the prevention of diseases (e.g. skin cancer, asthma) May include regulation of the CO_2/O_2 balance, maintaining ozone-layer (O_3), and regulation of SOx levels.

ANNEX 5: Management practices supporting the use and conservation of biodiversity for food and agriculture

Table 1. Management practices supporting the use and conservation of biodiversity for food and agriculture.

Management practices supporting the use and conservation of biodiversity for food and agriculture	**Description/ examples of management practices**
Integrated Plant Nutrient Management (IPNM)	Soil, nutrient, water, crop, and vegetation management practices undertaken with the aim of improving and sustaining soil fertility and land productivity and reducing environmental degradation, often tailored to a particular cropping and farming system. May include the use of farmyard manures, natural and mineral fertilizers, soil amendments, crop residues and farm wastes, agroforestry and tillage practices, green manures, cover crops, legumes, intercropping, crop rotations, fallows, irrigation, drainage, plus a variety of other agronomic, vegetative and structural measures designed to conserve both water and soil.
Integrated Pest Management (IPM)	Pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment by encouraging natural pest control mechanisms that include: crop rotation; inter-cropping; seedbed sanitation, sowing dates and densities, under-sowing, conservation tillage, pruning and direct sowing; where appropriate, use of pest resistant/tolerant cultivars, push-pull strategies and standard/certified seed and planting material; balanced soil fertility and water management, making optimum use of organic matter; prevent spreading of harmful organisms by field sanitation and hygiene measures; protection and enhancement of important beneficial organisms.
Pollination management	Practices that accomplish or enhance pollination of a crop, to improve yield or quality, by understanding of the particular crop's pollination needs, and by knowledgeable management of pollenizers, pollinators, and pollination conditions. Pollinator-friendly practices include minimizing the use of agrochemicals, integrated pest management and mixed cropping to include pollinator friendly crops, preserving wild habitats, maintaining flower-rich field margins, buffer zones and permanent hedgerows to ensure habitat and forage, cultivating shade trees, managing for bee nest sites, and establishing landscape configurations that favor pollination services.
Landscape management	Practices that support the maintenance of biodiversity friendly farming systems, or the diversity of landscape mosaics within and surrounding production systems over particular geographic areas. Examples include riparian corridors, hedges, margins, woodland patches, clearings in forests, ponds or other biodiversity friendly features characteristic of the production environment that may be the result of national or regional policies such as the EU set aside schemes.
Sustainable soil management practices	Management of soil biodiversity to enhance agricultural production by both direct and indirect means, including alteration of the abundance or activity of specific groups of organisms through inoculation and/or direct manipulation of soil biota. Indirect interventions may include manipulation of the factors that control biotic activity (habitat structure, microclimate, nutrients and energy resources) rather than the organisms themselves such as the maintenance of soil cover with organic mulch including crop residues, green manure/cover crops including legumes, and

	compost to increase soil organic matter, irrigation and liming, as well as cropping system design and management.
Conservation agriculture	Conservation Agriculture (CA) aims to achieve sustainable and profitable agriculture and improve livelihoods of farmers through the application of the three CA principles: no or minimal soil disturbance through direct seeding into untilled soils, maintenance of permanent soil mulch cover, and crop diversification through rotations, associations and sequences.
Water management practices, water harvesting	Water harvesting and management through rain water retention or modification of the landscape (e.g., bunds, zais, terracing) for the restoration and improvement of degraded lands, and to allow cultivation of additional crops with higher water requirements, and improving water productivity of crops.
Agroforestry	Agroforestry is a collective name for land-use systems where woody perennials (trees, shrubs, palms, etc.) are integrated in the farming system.
Organic agriculture	Organic agriculture is a production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system.
Low external input agriculture	Production activity that uses synthetic fertilizers or pesticides below rates commonly recommended for intensive industrial tillage agriculture. It does not mean elimination of these materials. Yields are maintained through greater emphasis on agronomic practices, IPM, and utilization of on-farm resources (especially labor) and management.
Home gardens	An integrated system which comprises different components in a small area around the homestead, including staple crops, vegetables, fruits, medicinal plants, livestock and fish both for home consumption or use and for income. May include the family house, a living/playing area, a kitchen garden, a mixed garden, a fish pond, stores, an animal house, etc.
Areas designated by virtue of production features and approaches	These include areas recognized nationally or internationally by virtue of their landscape and agricultural features. In addition to Satoyama, GIAHS, national parks (IUCN categories), they also include areas recognized for specific agricultural products (e.g. DOP, IGP or Slow Food).
Ecosystem approach in capture fisheries	Approach promoting the diversity of the whole ecosystem in order to support the target species. Considerations include sustainable harvesting of the retained species (target and by-product species); managing the direct effects of fishing (especially on non-retained by-catch and habitat); and managing the indirect effects of the fishery on ecosystem structure and processes.
Conservation hatcheries	Hatcheries and production systems that optimize natural levels and organization of genetic diversity over production. Often for rebuilding depleted populations of commercially important species, (e.g. Atlantic and Pacific salmon).
Reduced-impact logging	A series of practices to improve logging practices such as vine removal, directional felling, limiting skid trails, logging roads and stumping grounds, restrictions on the size and number of trees felled, and post felling removal of waterway blockages, to reduce the residual damage, biodiversity loss and excess CO_2 emissions associated with conventional logging practices.

ANNEX 6: Diversity based interventions

Table 1. Diversity based practices and interventions

Diversity based practices	Description/ examples of interventions
Diversification	The introduction of new varieties, species, and groups of organisms (e.g., livestock, crops, trees, fish) into a production system or managed environment without replacement or abandonment of other groups, or the maintenance of already-existing diversity in the case of traditionally diverse production systems. May include introductions for restoration or IPM objectives, including fish introduced to control reproduction.
Base broadening	Increasing the amount of genetic diversity used to produce new varieties or breeds used in agricultural production.
Domestication	The development of new crop, aquatic, forest and animal species through deliberate breeding programmes or the continued selection and improvement of existing species from their wild progenitors. These activities may be carried out by national breeding programmes or by farmers and communities themselves.
Maintenance or conservation of landscape complexity	Maintenance or management of components of a landscape mosaic including hedges, waterways, road margins, corridors, windbreaks, living fences, native grasses wild patches of vegetation in the farming landscape, etc.
Restoration practices	Restoring functionality and productive capacity to ecosystems, forests, landscapes, waterways, grasslands and rangelands in order to provide food, fuel, and fiber, improve livelihoods, store carbon, improve adaptive capacity, conserve biodiversity, prevent erosion and improve water provisioning and quality.
Management of micro-organisms	The intentional incorporation, management or maintenance of microbes, fungi and other micro-organisms into a production system or organisms; e.g., inoculation of plants and seeds with arbuscular mycorrhizal fungi, the addition of probiotics in aquaculture and livestock, etc.
Polyculture/Aquaponics	Integrated multi-trophic aquaculture, utilization of different trophic and spatial niches of an aquaculture system in order to obtain maximum fish production per unit area, utilizing natural resource availability.
Swidden and shifting cultivation agriculture	Rotation of plots from intensive cultivation to extended fallow periods for the replenishment of soil fertility.
Enriched forests	Selective logging and enrichment planting to increase the abundance of useful species for food, medicine and timber, often a feature of traditional management practices.

References

Agrofit. **Sistema de agrotóxicos fitossanitários**. Ministério da Agricultura, pecuária e Abastecimento. http://agrofit.agricultura.gov.br/agrofit_cons/principal_agrofit_cons. (accessed 25.08.17).

Alves, S.B.; Lopes, R.B. 2008. **Controle Microbiano de Pragas na América Latina: avanços e desafios**. FEALQ, Piracicaba, SP, Brazil.

Bettiol, W., 2011. **Biopesticide use and research in Brazil**. Outlooks Pest Manag. 2, 280–284.

Bettiol, W. et al., 2012. **Produtos comerciais à base de agentes de biocontrole de doenças de plantas**. Documentos 88, Jaguariúna, SP. Embrapa Meio Ambiente, 155 p.

Brasil: **5º Relatório Nacional para a Convenção Sobre Diversidade Biológica**. Ministério do Meio Ambiente. Secretaria de Biodiversidade e Florestas; Coordenador Carlos Alberto de Mattos Scaramuzza. Brasília: MMA, 2016. (http://www.mma.gov.br/informma/item/10772-quinto-relat%C3%B3rio).

Brasil. Ministério do Meio Ambiente. **Estratégia e Plano de Ação Nacionais para a Biodiversidade**. 2016-2020. http://www.mma.gov.br/images/arquivo/80049/EPANB/EPANB_08-09-17.pdf

Brasil. Ministério do Meio Ambiente. **Portaria n. 443, of 17 dezember de 2014**. Lista oficial da espécies da flora ameaçadas de extinção. (http://cncflora.jbrj.gov.br/portal/static/pdf/portaria_mma_443_2014.pdf).

Brasil. Ministério da Agricultura, Pecuária e Abastecimento. **Hortaliças não-convencionais: (tradicionais)**. Ministério da Agricultura, Pecuária e Abastecimento. Secretaria de Desenvolvimento Agropecuário e Cooperativismo. – Brasília: MAPA/ACS, 2010.

Carrillo, D., Amalin, D., Hosein, F., Roda, A., Duncan, R.E., Pena, J.E. 2012. Host plant range of Raoiella indica (Acari: Tenuipalpidae) in areas of invasion of the New World. **Experimental and Applied Acarology**, 57, 271–289.

Castilho, R.C., Moraes, G. J., Silva, E.S., Freire, R.A.P., Eira, C. 2009. The predatory mite *Stratiolaelaps scimitus* as a control agent of the fungus gnat *Bradysia matogrossensis* in commercial production of the mushroom *Agaricus bisporus*. **International Journal of Acarology,** 55: 181-185.

Cocco, A., Hoy, M.A. 2009. Feeding, reproduction, and development of the red palm mite (Acari: Tenuipalpidae) on selected palms and banana cultivars in quarantine. **Florida Entomologist**, 92, 276–291.

Conab - Companhia Nacional de Abastecimento. **Boletim da Sociobiodiversidade**, v.1, n.1, 2017 (http://www.conab.gov.br/detalhe.php?c=45163&t=2#this)

Conab - Companhia Nacional de Abastecimento. **Acompanhamento da safra brasileira de grãos**. Vol. 4 safra 2016/17. jun. 2017. http://www.conab.gov.br/OlalaCMS/uploads/arquivos/17_06_08_09_02_48_boletim_graos_junho_2017.pdf.

Doetzer, Al.K., Foerster, L.A. 2007. Desenvolvimento, longevidade e reprodução de *Trissolcus basalis* (Wollaston) e Telenomus podisi Ashmed (Hymenoptera: Scelionidae). **Neotropical Entomology**, 36(2):233-242.

Dorighello, D.V.; Bettiol, W.; Borlina, M.N.; Leite, R.M.V.B.C. 2015. Controlling Asian soybean rust (*Phakopsora pachyrhizi*) with *Bacillus* spp. and coffe oil. **Crop Protection**, 67:59-65.

Embrapa. **Práticas tecnológicas adotadas pelos produtores de dendezeiro híbrido interespecífico no Nordeste Paraense**. Belém, PA: Embrapa Amazônia Oriental, 2017. (Embrapa Amazônia Oriental, ISSN 1517-2201, 430).

FAO. 2017. **World production**. http://faostat.fao.org/site/339/default.aspx.

Faria, M.R., Wraight, S.P., 2007. Mycoinsecticides and mycoacaricides: A comprehensive list with worldwide coverage and international classification of formulation types. **Biol. Control**, 43, 237–256.

Flechtmann, C.H.W., Etienne, J. 2004. The red palm mite, Raoiella indica Hirst, a threat to palms in the Americas (Acari: Prostigmata: Tenuipalpidae). **Systematic and Applied Acarology,** 9, 109-110.

Freire, R.A.P., Moraes, G. J., Silva, E.S., Vaz, A.C.; Castilho, R.C. 2007. Biological control of *Bradysia matogrossensis* (Diptera: Sciaridae) in mushroom cultivation with predatory mites. **Experimental and Applied Acarology,** 42: 87-93.

Freitas, C.M.; Silva, D.R.X.; Sena, A.R.M.; Silva, E.L.; Sales, L.B.F.; Carvalho, M.L.; Mazoto, M.L.; Barcellos, C.; Costa, A.M.; Oliveira, M.L.C.; Corvalán, C. Desastres naturais e saúde: uma análise da situação do Brasil. **Ciência & Saúde Coletiva,** 19(9), 3645-3656, 2014.

Goble, T., Almeida, J., Conlong, D., 2017. Microbial Control of Sugarcane Insect Pests. In: Lacey L.A. (Ed). **Microbial Control of Insect and Mite Pests: From Theory to Practice**. Elsevier Academic Press, London, p.299-312.

Gómez-Moya, C.A., Lima, T.P.S., Morais, E.G.F., Gondim Jr., M.G.C. 2017. Hosts of Raoiella indica Hirst (Acari: Tenuipalpidae) native to the Brazilian amazon. **Journal of Agricultural Science**, 9, 86-93.

Gondim Jr., M.G.C., Castro, T.M.M.G., Marsaro, A.L., Navia, D., Melo, J.W.S., Demite, P.R., Moraes, G.J. 2012. Can the red palm mite threaten the Amazon vegetation? **Systematics and Biodiversity**, 10, 527-535.

Guerra, M.P.; Rocha, F.S.; Nodari, R.O. Biodiversidade, recursos genéticos vegetais e segurança alimentar em cenário de ameaças e mudanças. In: Veiga, R.F.A.; Queiróz, M.A. (Ed.). **Recursos fitogenéticos: a base da agricultura sustentável no Brasil**. Viçosa: Ed. UFV, 2015. p.39-52.

Hanna R., Yaninek J.S., Toko M., Onzo A., Gnanvossou D., Ojo D, Zannou L., Paraiso G. 1998. Current status of cassava green mite *Mononychellus tanajoa* Bondar (Acari: Tetranychidae) biological control in Africa. **Proceedings of the 7th Triennial Symposium of the International Society for tropical root crops.** Africa branch (ISTRC-AB), Cotonou, Benin,11-17.

Hata, F.T., Silva, J.E.P., Ventura, M.U., Pasini, A., Roggia, S. 2017. First Report of Raoiella indica (Hirst) (Acari: Tenuipalpidae) in Southern Brazil. **Neotropical Entomology**. doi:10.1007/s13744-016-0468-9.

IBGE – Anuário Estatistico do Brasil 2016 (https://biblioteca.ibge.gov.br/biblioteca-catalogo?id=720&view=detalhes)

ICMBio – Instituto Chico Mendes de Conservação da Biodiversidade. **Livro Vermelho da Fauna Brasileira Ameaçada de Extinção**. 2016. (http://www.icmbio.gov.br/portal/images/stories/comunicacao/publicacoes/publicacoes-diversas/dcom_sumario_executivo_livro_vermelho_ed_2016.pdf).

Instituto de Economia Agrícola. Defensivos Agrícolas: em 2014, faturamento do segmento foi o destaque. http://www.iea.sp.gov.br/out/verTexto.php?codTexto=13679

Kirsch, H.M.; Schneider, S. Vulnerabilidade social às mudanças climáticas em contextos rurais. **Revista Brasileira de Ciências Sociais**, 31(91), 2016.

Koch, K.A., Potter, B., Ragsdale, D.W., 2010. Non-target impacts of soybean rust fungicides on the fungal entomopathogens of soybean aphids. **J. Invertebr. Pathol.** 103, 156–164.

Lemes, P; Loyola, R; Mudanças climáticas e prioridades para conservação da biodiversidade. **Revista de Biologia Neotropical**, 47-57, 2014.

Li, Z., Alves, S.B., Roberts, D., Fan, M., Delalibera, I., Tang, J., Lopes, R.B., Faria, M., Rangel, D.E.N., 2010. Biological control of insects in Brazil and China: history, current programs and reasons for their successes using entomopathogenic fungi. **Biocontrol Sci. Technol**., 20, 117–136.

Lima, M.R., Rodriguez, H., Gonzalez, A.I., Gonzalez, M. 2011. Management strategy of Raoiella indica Hirst (Acari: Tenuipalpidae) in Cuba. In: Moraes, G.J., Proctor, H. (Eds.), **Acarology XIII:** Proceedings of the International Congress. Zoosymposia 6, 152–159.

Lopes, R.B., Mesquita, A.L.M., Tigano, M.S., Souza, D.A., Martins, I., Faria, M., 2013a. Diversity of indigenous *Beauveria* and *Metarhizium* spp. in a commercial banana field and their virulence toward *Cosmopolites sordidus* (Coleoptera: Curculionidae). **Fungal Ecol.** 6, 356–364.

Lopes, R.B., Souza, D.A., Oliveira, C., Faria, M., 2013b. Genetic diversity and pathogenicity of *Metarhizium* spp. associated with the white grub *Phyllophaga capillata* (Blanchard) (Coleoptera: Melolonthidae) in a soybean field. **Neotr. Entomol.** 42, 436–438.

Lopes, R.B., Faria, M., Souza, D.A., Bloch, C., Silva, L.P., Humber, R.A., 2014. MALDI-TOF mass spectrometry applied to identifying species of insect-pathogenic fungi from the *Metarhizium anisopliae* complex. **Mycologia**, 106, 865–878.

Magnusson, W.E. et al. A linha de véu: a biodiversidade brasileira desconhecida. **Parc. Estrat.,** 21(42), 45-60, 2016.

Michereff-Filho, M., Faria, M., Wraight, S.P., Silva, K.F.A.S., 2009. Micoinseticidas e micoacaricidas no Brasil: como estamos após quatro décadas? **Arq. Inst. Biol.** 76, 769–779.

Mineiro, J.L.C., Moraes, G.J. 2001. Gamasida (Arachnida: Acari) Edáficos de Piracicaba. Estado de São Paulo. **Neotropical Entomology,** 30, 379–386.

Monteiro, L.B. 2002. Criação de ácaros fitófagos e predadores: um caso de produção de *Neoseiulus californicus* em produtores de maçã. In: Parra, J.R.P., Botelho, P. S.M., Correa-Ferreira, B.S.; Bento, J.M.S. (Org.). **Controle biológico no Brasil: parasitóides e predadores.** São Paulo: Manole. p.351-365.

Monteiro, L.B., 1994. Manejo integrado de *Panonychus ulmi* em macieira. Primeiras experiências com a introdução de *Neoseiulus californicus*. Revista Brasileira de Fruticultura 16, 46-53.

Monteiro, L.B., Belli, L., Souza, A., Werner, A.L., 2002. Efeito do manejo de plantas daninhas sobre *Neoseiulus californicus* (Acari: Phytoseiidae) em pomar de macieira. Revista Brasileira de Fruticultura 24, 680-682.

Moraes, G.J., Alencar, J.A., Wenzel Neto, F., Mergulhao, S.M.R. 1990. Explorations for natural enemies of the cassava green mite in Brazil. *In:* Howeler, R.H. (Ed.), **Proceedings of the Eight Symposium of the International Society of Tropical Root Crops**. Bangkok, Thailand, pp. 351–353.

Moreira, G.F., Moraes, G.J. 2015. The potential of free-living laelapid mites (Mesostigmata: Laelapidae) as biological control agents. In: Carrillo, D., Moraes, G.J., Peña, J.E. (Eds). **Prospects for biological control of plant feeding mites and other harmful organisms.** New York: Springer. pp. 77–102.

Moreira, R.R.; Nesi, C.N.; De Mio, L.M. 2014. *Bacillus* spp. and *Pseudomonas putida* as inhibitors of the *Colletotrichum acutatum* group and potential to control Glomerela leaf spot. **Biological Control**, 72:30-37.

Moscardi, F.; Morales, L.; Santos, B. 2002. The successful use of AgMNPV for the control of the velvetbean caterpillar, *Anticarsia gemmatalis*, in soybean in Brazil. In: **XXXV Annual Meeting of the Society for Invertebrate Pathology, Proceedings**. Brazil, Foz de Iguassu, p. 86-91.

Moscardi F.; Sosa-Gómez, D.R. 2000. Microbial Control of Insect Pests of Soybeans. In **Field manual of techniques in invertebrate pathology: Application and Evaluation of Pathogens for Control of Insects and other Invertebrate Pests**. Lacey, L; Kaya, H. (eds.), Dordrecht Hardbound: Kluwer Academic Publishers, p. 447-466.

Navia, D., Marsaro Jr, A.L., Gondim Jr, M.G.C., Mendonça, R.S., Pereira, P.R.V.S. 2013. Recent mite invasions in South America. In: Peña, J. **Potential invasive pests of agricultural crops.** CAB International. cap 15. p. 251- 287.

Navia, D., Marsaro Jr., A.L., Gondim Jr., M.G.C., Mendonça, R.S., Pereira, P.R.V.S. 2013. Recent mite invasions in South America. In: Peña, J. **Potential invasive pests of agricultural crops.** CAB International. cap 15. p. 251- 287.

Navia, D., Marsaro, A.L.J., da Silva, F.R., Gondim, M.G.C. Jr, de Moraes, G.J. 2011. First report of the red palm mite, Raoiella indica Hirst (Acari: Tenuipalpidae), in Brazil. **Neotropical Entomology**, 40, 409–411.

Navia, D., Morais, E.G.F., Mendoça, R.S., Gondim Jr., M.G.C. 2015. Ácaro vermelho-das-palmeiras, Raoiella indica Hirst. In: Vilela, E.F., Zucchi, R.A. (Eds.). **Pragas introduzidas no Brasil: Insetos e ácaros.** Piracicaba, SP: ESALQ/USP. p.418-452.

Okassa, M., Kreiter, S., Guichou, S. & Tixier, M.-S. 2011. Molecular and morphological boundaries of the predatory mite *Neoseiulus californicus* (McGregor) (Acari: Phytoseiidae). **Biological Journal of the Linnean Society,** 104, 393–406.

Okassa, M., Tixier, M.-S., Kreiter, S. 2010. Morphological and molecular diagnostics of *Phytoseiulus persimilis* and *Phytoseiulus macropilis* (Acari: Phytoseiidae). **Experimental & Applied Acarology,** 52, 291–303.

Oliveira, H., Fadini, M.A.M., Venzon, M., Rezende, D., Pallini, A. 2009. Evaluation of the predatory mite *Phytoseiulus macropilis* (Acari: Phytoseiidae) as a biological control agent of the two-spotted spider mite on strawberry plants under greenhouse conditions. **Experimental and Applied Acarology,** 47, 275-283.

Oliveira, D.C., Prado, E.P., Moraes, G.J., Morais, E.G.F., Chagas, E.A., Gondim Jr., M.G.C., Navia, D. 2016. First report of Raoiella indica (Acari: Tenuipalpidae) in southeastern Brazil. **Florida Entomologist**, 99, 123-125.

Parra, J.R.; Alves, G.R.; Diniz, A.J.F.; Vieira, J.M. 2016. Tamarixia radiate (Hymenoptera: Eulophidae) x Diaphorina citri (Hemiptera: Liviidae): Mass Rearing and Potential use of the Parasitoid in Brazil. Journal of Integrated Pest Management 7:1-11.

Parra, J.R.P.; Zucchi, R.A. 2004. *Trichogramma* in Brazil: feasibility of use after twenty years of research. **Neotropical Entomology**, 33: 271-284.

Parra, J.R.P.; Costa, V.A.; Pinto, A.S., 2011. **Insetos parasitoides**. Ciência e Ambiente 43: 19-36.

Parra, J.R.P., 2014. Biological Control in Brazil: An overview. **Sci. Agric.**, 71(5), 345–355.

Perini, C.R.; Arnemann, J.A.; Melo, A.A.; Pes, M.P.; Valmorbida, I.; Beche, M.; Guedes, J.V.C. 2016. How to control *Helicoverpa armigera* on soybean in Brazil? What we have learned since its detection. **African Journal of Agricultural Research**, 11:1426-1432.

Peña, J.E., Carrillo, D., Rodrigues, J.C.V., Roda, A. 2010. El ácaro rojo de las palmas, Raoiella indica (Acari: Tenuipalpidae), una plaga potencial para América Latina. In: Sánchez Gálvez, M.C., Sandoval-Islas, J.S., Estrada-Venegas, E.G.E. (Eds.) **Primer Simposio Internacional de Acarología en México– Memorias**. Chapingo: Universidad Autónoma de Chapingo. p. 48-57.

Pires, C.S.S.; Pereira, F.M.; Lopes, M.T.R.; Nocelli, R.C.F.; Malaspina, O.; Pettis, J.S.E Teixeira, E.W. Enfraquecimento e perda de colônias de abelhas no Brasil: há casos de CCD. **Pesq. Agropec. Bras.,** 51(5), 422-442, 2016.

Poletti, M., Konno, R.H., Sato, M.E. and Omoto, C., 2006. Controle Biológico aplicado do ácaro rajado em cultivo protegido: viabilidade no emprego dos ácaros predadores. In: Pinto, A.S., Nava, D.E., Rossi, M.M., Malerbo-Souza, D.T. (orgs.) **Controle biológico de pragas: na prática**. Piracicaba: FEALQ, pp. 193-203.

Poletti, M., Omoto, C. 2012. Susceptibility to deltamethrin in the predatory mites *Neoseiulus californicus* and *Phytoseiulus macropilis* (Acari: Phytoseiidae) populations in protected ornamental crops in Brazil. **Experimental and Applied Acarology**, 58, 385-393.

Rezende, J.M., Zanardo, A.B.R., Lopes, M.D., Delalibera I., Rehner, S.A., 2015. Phylogenetic diversity of Brazilian *Metarhizium* associated with sugarcane agriculture. **Biocontrol**, 60, 495–505.

Roda, A., Nachman, G., Hosein, F., Rodrigues, J.C.V., Peña, J.E. 2012. Spatial distributions of the red palm mite, Raoiella indica (Acari: Tenuipalpidae) on coconut and their implications for development of efficient sampling plants. **Experimental and Applied Acarology,** 57, 291–308.

Rodrigues, J.C.V., Antony, L.M.K. 2011. First report of Raoiella indica (Acari: Tenuipalpidae) in the Amazonas State, Brazil. **Florida Entomologist,** 94, 1073-1074.

Rocha, L.F.N., Inglis, P.W., Humber, R.A., Kipnis, A., Luz, C., 2013. Occurrence of *Metarhizium* spp. in Central Brazilian soils. **J. Basic. Microbiol.** 53, 251–259.

Sanches, M.A. 2000**.** Parasitism of eggs of *Gonipterus scutellatus* Gyllenhal, 1833 and *G. gibberus* Boisduval, 1835 (Coleoptera, Curculionidae) by the mymarid *Anaphes nitens* (Girault, 1928) (Hymenoptera, Mymaridae) in Colombo, PR, Brazil. Arq. **Instituto Biológico,** 67(1), 77-82.

Santiago-Haase, S., Sciocco-Cap, A., Romanowski, V., 2015. Baculovirus Insecticides in Latin America: Historical Overview, Current Status and Future Perspectives. **Viruses**, 7, 2230-2267.

Sato, M.E., M.E.., Silva, M.Z., Souza-Filho, M.F, Matioli, A.L., Raga, A. 2007. Management of *Tetranychus urticae* (Acari: Tetranychidae) in strawberry fields with *Neoseiulus californicus* (Acari: Phytoseiidae) and acaricides. **Experimental and Applied Acarology,** 42, 107-120.

Sato, M.E., Silva, M.Z., Gonçalves, L.R., Souza-Filho, M.F, Raga, A. 2002. Toxicidade diferencial de agroquímicos a *Neoseiulus californicus* (McGregor) (Acari: Phytoseiidae) e *Tetranychus urticae* Koch (Acari: Tetranychidae) em morangueiro. **Neotropical Entomology**, 31, 449-456.

Sato, M.E.., Silva, M.Z., Souza-Filho, M.F, Raga, A. 2002. Manejo de *Tetranychus urticae* Koch (Acari: Tetranychidae) em morangueiro utilizando ácaros predadores (Phytoseiidae) e propargite. **Arquivos do Instituto Biologico,** 69, 261-264.

Schiesari L, Waichman A, Brock T, Adams C, Grillitsch B. 2013 Pesticide use and biodiversity conservation in the Amazonian agricultural frontier. Phil Trans R Soc B 368: 20120378. http://dx.doi.org/10.1098/rstb.2012.0378

Sosa-Gómez, D.R., López-Lastra, C.C, Humber, R.A., 2010. An overview of arthropod-associated fungi from Argentina and Brazil. **Mycopathologia**, 170, 61–76.

Sosa-Gómez, D.R., 2017. Microbial Control of Soybean Pest Insects and Mites. In: Lacey L.A. (Ed). **Microbial Control of Insect and Mite Pests: From Theory to Practice**. Elsevier Academic Press, London, p.199-208.

Sosa-Gómez, D.R., Delpin, K.E., Moscardi, F., Nozaki, M.H., 2003. The impact of fungicides on Nomuraea rileyi (Farlow) Samson epizootics and on populations of Anticarsia gemmatalis Hubner (Lepidoptera: Noctuidae), on soybean. **Neotrop. Entomol.** 32, 287–291.

Sturza, V.S.; Poncio, S; Santos, A.B., Lopes-da-Silva, M. 2012. Infestation and natural parasitismo of aphids in single and mixed pastures of black oats and ryegrass. **Neotropical Entomology**, 56(3): 363-367.

Urban, M.C.G. Bocedi, A. P. Hendry, J.-B. Mihoub, G. Peer, A. Singer, J. R. Bridle, L. G. Crozier, L. De Meester, W. Godsoe, A. Gonzalez, J. J. Hellmann, R. D. Holt, A. Huth, K. Johst, C. B. Krug, P. W. Leadley, S. C. F. Palmer, J. H. Pantel, A. Schmitz, P. A. Zollner, and J. M. J. Travis. 2016. **Improving the forecast for biodiversity under climate change**. Science 353:aad8466

Van Lenteren, J.C., Bolckmans, K., Köhl, J., Ravensberg, W.J., Urbaneja, A., 2017. Biological control using invertebrates and microorganisms: plenty of new opportunities. **BioControl.** DOI 10.1007/s10526-017-9801-4.

Viana, B.F. **Plano de manejo para polinização de macieiras da variedade Eva: conservação e manejo de polinizadores para a agricultura sustentável, através de uma abordagem ecossistêmica**. Rio de Janeiro, 2015. Disponível em http://www.mma.gov.br/publicacoes/biodiversidade/category/57polinizadores?download=1224:plano-de-manejo-para-poliniza%C3%A7%C3%A3o-de-macieiras-da-variedade-eva

Watanabe, M. A., Moraes, G. J., Nicolella, G. 1994. Controle biológico do ácaro rajado com ácaros predadores fitoseídeos (Acari: Tetranychidae, Phytoseiidae) em culturas de pepino e morango. **Scientia Agricola,** 51, 75-81.

Yaninek, J. S., Hanna, R. 2003. Green cassava mite in Africa – a unique example of successful biological control of a mite pest on a continental scale. In: Neuenschwander, P., Borgemeister, C., Langewald, J. (Eds.). **Biological control in IPM systems in Africa.** Wallingford: CABI Publishing. pp. 61-75.