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Продовольственная и
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Naciones Unidas para la
Alimentación y la Agricultura

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COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Item 7.3 of the Provisional Agenda

Seventeenth Regular Session

Rome, 18–22 February 2019

BIODIVERSITY FOR FOOD AND AGRICULTURE – NEEDS AND POSSIBLE ACTIONS

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I. INTRODUCTION

1. In adopting its Multi-Year Programme of Work at its Eleventh Regular Session, the Commission on Genetic Resources for Food and Agriculture (Commission) decided to initiate the preparation of a global assessment of the state of biodiversity for food and agriculture¹ based on reports prepared by countries, global assessments prepared under the guidance of the Commission, thematic studies, reports from international organizations and inputs from other relevant stakeholders.²
2. At its Sixteenth Regular Session, the Commission welcomed a first draft of *The State of the World's Biodiversity for Food and Agriculture* (Report).³ It requested the Secretariat to make available a Revised Draft Report for review by Members and observers between March and June 2018 and to finalize the Report in the second half of 2018.⁴ The Report has been made available to this session. Detailed information on the review and finalization of the Report is provided in the document *Preparation of The State of the World's Biodiversity for Food and Agriculture*.⁵
3. Between March and May 2016, informal regional consultations on the state of biodiversity for food and agriculture were held in all regions except North America. These consultations allowed National Focal Points (NFPs) to share knowledge and information and to discuss regional needs and possible actions for the sustainable use and conservation of biodiversity for food and agriculture. The needs and possible actions, as identified during these consultations⁶ and consolidated by the Secretariat, formed the basis of discussions during the Commission's last session.⁷
4. The Commission, at its last session, also requested the Secretary to invite Members and observers to submit comments on the needs and possible actions presented in the document *Biodiversity for food and agriculture – needs and possible actions*⁸, and proposals for additional needs or possible actions. Through Circular State Letter C/CBD-8 of 28 February 2018, the Secretary invited Members and observers to provide relevant inputs. The submissions received are contained in the document *Submissions by countries on the needs and possible actions for the conservation and sustainable use of biodiversity for food and agriculture*.⁹ The Secretariat reviewed and revised the draft needs and possible actions in the light of comments and suggestions received, taking into account the findings of the Revised Draft Report.¹⁰
5. The Commission, at its last session, also requested the Secretary to convene NFPs nominated by the regions¹¹ for a three-day meeting to review and revise, as appropriate, the revised draft needs and possible actions for consideration and finalization by the Commission.¹² The Group of National Focal Points for Biodiversity for Food and Agriculture met in Rome from 18 to 20 June 2018.¹³ The Group reviewed and revised the draft needs and possible actions on biodiversity for food and agriculture, as given in *Appendix I* to this document.

II. GUIDANCE SOUGHT

6. The Commission may wish to:
 - i. Review and revise, as appropriate, the revised draft needs and possible actions on

¹ CGRFA-11/07/Report, *Appendix E*.

² CGRFA-14/13/Report, paragraph 14.

³ CGRFA-16/17/Report/Rev.1, paragraph 10.

⁴ CGRFA-16/17/Report/Rev.1, paragraphs 12-13.

⁵ CGRFA-17/19/7.1.

⁶ CGRFA-16/17/Inf.11.1 to CGRFA-16/17/Inf.11.6.

⁷ CGRFA-16/17/Report Rev.1, paragraphs 16-18.

⁸ CGRFA-16/17/4.

⁹ CGRFA-17/19/7.3/Inf.1.

¹⁰ CGRFA-16/17/Report/Rev.1, paragraph 16.

¹¹ CGRFA-16/17/Report/Rev.1, paragraph 17.

¹² CGRFA-16/17/Report/Rev.1, paragraph 18.

¹³ CGRFA-17/19/7.2.

- biodiversity for food and agriculture, as contained in *Appendix I* to this document;
- ii. invite the Director-General to bring the document to the attention of the Conference with a view to adopting it as the Global Plan of Action on Biodiversity for Food and Agriculture;
 - iii. invite countries to implement the Global Plan of Action on Biodiversity for Food and Agriculture;
 - iv. request FAO to assist Members in the implementation of the Global Plan of Action on Biodiversity for Food and Agriculture; and
 - v. invite donors to provide extra-budgetary resources to support Members in the implementation of the Global Plan of Action on Biodiversity for Food and Agriculture and in monitoring its implementation.

APPENDIX I

BIODIVERSITY FOR FOOD AND AGRICULTURE – REVISED DRAFT NEEDS AND POSSIBLE ACTIONS

1. Introduction

1. Biodiversity for food and agriculture (BFA), along with the ecosystem services it supports, is essential to sustainable food and agriculture. It is necessary to enable production systems and livelihoods to cope with and evolve under changing social, economic and environmental conditions, is a key resource in efforts to ensure food security and nutrition while limiting or reducing negative impacts on the environment, and makes multiple contributions to the well-being and livelihoods of many households.

2. Over recent decades, the importance of biodiversity and ecosystem services to food security and nutrition, rural and coastal livelihoods, human well-being and sustainable development more generally has gradually been acquiring greater recognition on international agendas. In 1995, the Commission on Plant Genetic Resources became the Commission on Genetic Resources for Food and Agriculture (Commission) and acquired a mandate covering all components of biodiversity of relevance to food and agriculture. Over the years, the Commission has overseen global assessments of genetic resources in the plant, animal, forest and aquatic sectors and adopted global plans of action for genetic resources in the first three of these sectors (referred to in this text as the sectoral global plans of action).¹⁴ The Sustainable Development Goals (SDGs), adopted by the United Nations in 2015, include a number of targets related to the sustainable use and conservation of biodiversity in the context of food and agriculture, including those developed by the Commission. Other global assessments, such as those undertaken by Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), and reporting by countries on achievements in the implementation of their National Biodiversity Strategies and Action Plans (NBSAPs) to achieve the Convention on Biological Diversity's (CBD's) Aichi Biodiversity Targets, have increased awareness about biodiversity in general and its contribution to livelihoods and human well-being in particular.

3. In adopting its Multi-Year Programme of Work, the Commission, at its Eleventh Regular Session, decided to initiate a country-driven process for the preparation of *The State of the World's Biodiversity for Food and Agriculture* (Report). In 2013, FAO invited Member Countries to submit country reports on the state of their BFA. At its Sixteenth Regular Session, in January 2017, the Commission requested FAO to finalize the Report in 2018.

4. In the course of 2016, the Commission held informal regional consultations to share information on, and identify needs and possible actions for, the sustainable use and conservation of BFA. The needs and possible actions for the sustainable use and conservation of BFA identified in this document are the result of these regional consultations.

¹⁴ FAO. 1996. *The State of the World's Plant Genetic Resources for Food and Agriculture*. Rome (available at <http://www.fao.org/3/a-w7324e.pdf>); FAO. 2007. *The State of the World's Animal Genetic Resources for Food and Agriculture..* Rome (available at <http://www.fao.org/3/a-a1260e.pdf>); FAO. 2007. *The Global Plan of Action for Animal Genetic Resources and the Interlaken Declaration*. Rome (available at <http://www.fao.org/docrep/010/a1404e/a1404e00.htm>); FAO. 2010. *The Second Report on the State of the World's Plant Genetic Resources for Food and Agriculture*. Rome. (available at <http://www.fao.org/docrep/013/i1500e/i1500e.pdf>); FAO. 2011. *Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture*. Rome. (available at <http://www.fao.org/docrep/015/i2624e/i2624e00.htm>); FAO. 2014. *The State of the World's Forest Genetic Resources*. Rome (available at <http://www.fao.org/3/a-i3825e.pdf>); FAO. 2014. *Global Plan of Action for the Conservation, Sustainable Use and Development of Forest Genetic Resources*. Rome (available at <http://www.fao.org/3/a-i3849e.pdf>); FAO. 2015. *The Second Report on the State of World's Animal Genetic Resources for Food and Agriculture*. Rome (available at <http://www.fao.org/3/a-i4787e.pdf>); FAO. forthcoming. *The State of the World's Aquatic Genetic Resources for Food and Agriculture*. Rome.

5. This document identifies needs and priority actions for BFA, i.e. “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 agricultural products”.¹⁵ “Production systems” are taken to include those in the crop, livestock, forest, fishery and aquaculture sectors. As per FAO’s definition, agriculture is inclusive of forestry, fisheries and aquaculture. Further concepts used in this document are described in Annex 1.

2. Rationale

6. BFA, i.e. biodiversity that in one way or another contributes to agriculture and food production, is indispensable to food security and nutrition, sustainable development and the supply of many vital ecosystem services. Many countries have taken action to sustainably use and conserve, through various strategies, a range of plant, animal, forest and aquatic genetic resources. The Commission has provided and continues to provide guidance on the sustainable use and conservation of the various components of BFA through important, though mainly sector-specific, instruments and decisions. FAO monitors the implementation of these instruments and reports back to the Commission on their status of implementation and the status of the different sectors of genetic resources for food and agriculture (GRFA). However, there is a need for integrated management of the various components of BFA, going beyond sector-specific GRFA strategies and sustainably using and conserving BFA, including all GRFA, through more systematic approaches. Specific measures are needed in order to reverse the ongoing loss of BFA, improve its conservation and ensure its sustainable use through holistic and cross-sectoral management approaches, at genetic, species and ecosystem levels.

7. Key features of BFA include the following:

Important components of BFA¹⁶

- GRFA are a key component of BFA. Knowledge of the characteristics, population status, breeding for sustainable use and conservation of GRFA exists – for example, of crop varieties, livestock breeds, tree and other woody plant species, aquatic strains and species, micro-organisms and invertebrates, i.e. those directly used in the various sectors – although with regional and sectoral differences.
- Associated biodiversity is another component of BFA and is essential to the supply of many ecosystem services that underpin food and agricultural production. Components of associated biodiversity, for example pollinators, soil and aquatic organisms and the natural enemies of pest species in and around crop, livestock, forest and aquatic production systems, play a significant role in maintaining or increasing biodiversity within these systems, thus strengthening rural livelihoods, improving food security and nutrition and enhancing sustainability and resilience in the face of challenges such as climate change.
- The wild foods component of BFA encompasses those that contribute to major economic sectors such as capture fisheries, and a wide range of other, mostly locally harvested, fungi, plants and animals, including invertebrates. They are important for food security and nutrition in many countries, yet are increasingly at risk of loss. Wild species harvested as sources of food are an important, but often overlooked, component of biodiversity in and around production systems. Some wild foods are relatives of domesticated species, have potential for domestication and provide a pool of genetic resources for hybridization and selection.

Assessment and monitoring

¹⁵ FAO. 2013. *Guidelines for the preparation of the country reports for The State of the World’s Biodiversity for Food and Agriculture*. Rome (available at <http://www.fao.org/3/a-as644e.pdf>).

¹⁶ See Annex 1 for descriptions of concepts used in this document.

- Knowledge of the state of associated biodiversity, ecosystem services and wild foods varies from region to region and is often incomplete. Many invertebrates and micro-organisms, as well as some plant and other animal species, found in and around production systems, have not been recorded or characterized, and their functions within ecosystems remain poorly understood.
- The underdeveloped state of monitoring programmes for associated biodiversity and wild foods means that data on their status and trends are inevitably patchy. Population surveys and proxy measures provide an indication of the status of individual categories of associated biodiversity at local, national or regional levels. Data of this kind present a mixed picture, but there are many grounds for concern about the decline of key components of associated biodiversity.

Drivers of change

- Associated biodiversity and the ecosystem services it delivers are being affected, often negatively, by a range of drivers. Yet they can also serve as a source of resilience to the effects of many of these drivers and as a basis for the adaptation of production systems to current and future challenges. Drivers range from local to global in scale and from developments in technology and management practices within the food and agriculture sector to wider environmental, economic, social, cultural and political factors.

Legal and policy frameworks

- Most countries have put in place policy and legal frameworks targeting the sustainable use and conservation of biodiversity as a whole, and many have nature-protection measures in place for wild biodiversity, often complemented by specific policies for specific GRFA, or they may integrate GRFA into sectoral or rural-development policies. Policies addressing the management of food and agricultural production systems are increasingly based on ecosystem, landscape and seascape approaches. However, these legal and policy frameworks often lack a specific focus on associated biodiversity or wild foods. While national and international agreements are in place to reduce overexploitation of captured fish species or forests, legal and policy measures explicitly targeting other wild foods or components of associated biodiversity and their roles in supplying ecosystem services are not widely reported.
- A number of obstacles constrain the development and implementation of effective policies addressing the sustainable use and conservation of BFA, and of associated biodiversity in particular. Implementation is sometimes hampered by a lack of human and financial resources, a lack of awareness and knowledge on the part of stakeholders, a lack of political will and/or governance and a lack of cooperation among relevant agencies.

Management and cooperation

- Efforts to manage BFA, especially associated biodiversity, to promote the supply of regulating and supporting ecosystem services are widely reported.
- The use of a range of management practices regarded as favourable to the sustainable use and conservation of BFA is reported to be increasing. However, knowledge of how these practices influence the status of BFA still needs to be improved.
- Sustainable management of BFA and promotion of its role in the supply of ecosystem services require multi-stakeholder, cross-sectoral and international cooperation. The use of BFA spans international borders and the conventional boundaries between sectors. Frameworks for cooperation at national, regional and international levels in the management of genetic resources are relatively well developed in the individual sectors of food and agriculture.

8. The sustainable use and conservation of BFA face several challenges. For example, BFA covers many fields and sectors – ranging from GRFA to associated biodiversity, such as pollinators and soil micro-organisms, to habitats and ecosystems – that cannot be managed in isolation. Among the challenges reported by countries is the need to put in place cross-sectoral collaboration and cooperation mechanisms to manage BFA effectively.

9. The Commission's sectoral global plans of action address GRFA and set out strategic priorities for the sustainable use, development and conservation of genetic resources, as well as provisions related to collaboration, financing and implementation. The Commission guides, supports and monitors the implementation of the sectoral global plans of action and assesses, at regular intervals, the status of their implementation and of the respective components of GRFA.

10. The needs and [possible] actions compiled in this document reflect the challenges identified by countries during the preparation of the Report. A strong emphasis is placed on actions that seek to further improve knowledge of BFA, in particular of the species and ecosystem-level components, for example associated biodiversity, that lag behind others in this respect, and of the impacts of management practices and approaches on BFA. Also stressed is the need to implement practical approaches and actions to improve the management of BFA. Even greater emphasis is given to the importance of cooperation and collaboration, at all levels, in the management, sustainable use and conservation of BFA.

11. Recognizing the importance of avoiding duplication, and the need for collaboration and coordination, this document provides an overarching framework for the sustainable use and conservation of BFA as a whole. Action should be taken by countries in accordance with their national priorities and international commitments, as appropriate. The document neither changes, nor replaces, the Commission's existing sectoral global plans of action. Instead, it complements them and creates an overall enabling framework for their consistent and coherent implementation. Also, in view of the cross-sectoral work of the Commission on access and benefit-sharing for GRFA, the document does not refer to access and benefit-sharing issues.

3. Nature of the document

12. This document aims to promote coordinated action across sectors relevant to BFA at genetic, species and ecosystem levels. It is voluntary and non-binding. It does not aim to replace or duplicate the sectoral global plans of action for GRFA, or other international agreements, but to strengthen their harmonious implementation, as applicable. The document should be updated as and when required.

4. Objectives

13. With regard to BFA, especially associated biodiversity, and the regulating and supporting ecosystem services it underpins, the actions contained in this document aim to:

- raise awareness of the importance of BFA among all stakeholders involved, from producers to consumers and policy-makers;
- create an enabling framework for the coherent and consistent implementation of the Commission's existing sectoral global plans of action and for the sustainable use and conservation of associated biodiversity and wild foods and thus for the conservation of all BFA, as a basis for food security, sustainable food and agriculture and poverty reduction;
- promote the management and sustainable use of BFA, in particular associated biodiversity and wild foods, within production systems and terrestrial and aquatic ecosystems, as a basis for ecosystem services and resilience, in order to foster economic development and to reduce hunger and poverty, particularly in developing countries, as well as to provide options for adapting to and mitigating climate change;

- set the conceptual basis and framework for the development and adoption of national policies, legislation and programmes for the management, sustainable use and conservation of BFA;
- increase national, regional and international cross-sectoral cooperation and information-sharing and enhance institutional capacity, including in research, education and training on the sustainable use and conservation of BFA;
- improve data collection and the development of metrics and indicators to measure the impact of management practices and approaches on the sustainable use and conservation of BFA at genetic, species and ecosystem levels; and
- reduce unintended and unnecessary duplication of actions in order to promote efficiency and effectiveness in global, regional and national efforts to sustainably use and conserve BFA.

5. Structure and organization

14. The document presents a set of integrated and interlinked [possible] actions, organized into three priority areas, for the sustainable use and conservation of BFA. Many of these [possible] actions are relevant to more than one priority area.

Priority Area 1: Assessment and monitoring of biodiversity for food and agriculture

Priority Area 2: Management of biodiversity for food and agriculture

Priority Area 3: Institutional frameworks for biodiversity for food and agriculture

15. The [possible] actions are not listed in order of priority, as the relative priority of each area for [possible] action and associated timelines may vary significantly across countries and regions. Relative priority may depend on the components of BFA themselves, the natural environment or production systems involved, current management capacities, financial resources or policies already underway for the management of BFA.

16. For each area of [possible] action, an introduction presents the needs identified on the basis of country reports prepared as contributions to the Report and the consultative processes described above. A number of specific priorities are then presented. Each priority consists of a rationale and a set of individual [possible] actions.

**PRIORITY AREAS FOR THE SUSTAINABLE USE AND CONSERVATION OF
BIODIVERSITY FOR FOOD AND AGRICULTURE**

**PRIORITY AREA 1: ASSESSMENT AND MONITORING OF BIODIVERSITY FOR
FOOD AND AGRICULTURE**

1.1 Improve availability of, and access to, information on biodiversity for food and agriculture

**PRIORITY AREA 2: MANAGEMENT OF BIODIVERSITY FOR FOOD AND
AGRICULTURE**

2.1 Promote integrated approaches to the management of biodiversity for food and agriculture

2.2 Improve conservation of biodiversity for food and agriculture

**PRIORITY AREA 3: INSTITUTIONAL FRAMEWORKS FOR BIODIVERSITY FOR
FOOD AND AGRICULTURE**

3.1 Build capacity through awareness raising, research, education and training

3.2 Strengthen legal, policy and incentive frameworks

3.3 Cooperation and funding

PRIORITY AREA 1: ASSESSMENT AND MONITORING OF BIODIVERSITY FOR FOOD AND AGRICULTURE

Introduction

The identification, characterization, assessment and monitoring of biodiversity for food and agriculture (BFA) (see Annex 1 for concepts used in this document) are essential to its sustainable use and conservation. The assessment and monitoring of the state and trends of BFA and of its management at national, regional and global levels are uneven, and often limited and partial. The extent and character of existing knowledge gaps also vary significantly across the various categories of BFA.

In the case of domesticated plant, animal and aquatic genetic resources for food and agriculture (GRFA) – and of species that are widely harvested from the wild (e.g. forest trees and other woody plant species and species in capture fisheries) – inventories and information exist, although to varying degrees across the regions of the world and across sectors. At global level, monitoring systems for GRFA have been developed, for example the World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture (WIEWS), the Domestic Animal Diversity Information System (DAD-IS) and the FAO Worldwide Information System on Forest Genetic Resources (Reforgen).

Monitoring of major ecosystems of importance to food and agriculture is generally conducted at national, regional and global levels for inland and coastal wetlands, coral reefs, mangroves, seagrass beds, forests and rangelands, although at varying levels of comprehensiveness.

In contrast, many associated biodiversity species that provide regulating and supporting ecosystem services, particularly micro-organisms and invertebrates, have not been identified and documented. Population trends are relatively well documented for some taxonomic groups (such as some vertebrates) but, for others, knowledge is almost non-existent. In many cases, characterization and systematization of individual species are very difficult, and metagenomics and other “omics” methods can be used to identify assemblages.

In many cases, the contributions of specific components of BFA to the supply of ecosystem services are poorly understood, as are the effects of particular drivers (including climate change) on population sizes and distributions and on the ecological relationships that underpin the supply of ecosystem services.

In view of the above, there is an overall need to improve the availability of data and information. More specific needs include improving methodologies for recording, storing and analysing data (including geographic information systems) on changes in the abundance and distribution of species and ecosystems and improving capacity for monitoring and assessment, for example by increasing the number of skilled taxonomists.

Priority 1.1 Improve availability of, and access to, information on biodiversity for food and agriculture

Rationale

BFA is composed of a myriad of species, and within them of populations, varieties, breeds and strains. Recognizing the central importance of GRFA, and of their characterization, assessment and monitoring, provisions for these actions have been agreed in the sectoral global plans of actions for the respective genetic resources.

There is a need to improve knowledge of other species of importance to food and agriculture, for example associated biodiversity providing pollination and pest and disease regulation services and wild foods, as well as entire ecosystems and habitats, building on and strengthening existing data where possible. Given the wide scope of these components of BFA and variations in the needs and capacities of countries, priority species, ecosystems or ecosystem services for assessment and monitoring need to be established at national level.

A wide range of management practices and approaches exist that make use of various components of BFA and are thus considered to contribute to its maintenance and enhanced use. Such practices and approaches include those used at production level (e.g. conservation agriculture, pollination management, organic agriculture and integrated pest management), mixed production systems (e.g. agroforestry, integrated crop–livestock–aquatic systems and diversification practices in aquaculture), restoration practices, and approaches at terrestrial and aquatic ecosystem level (e.g. ecosystem approaches to fisheries and aquaculture, sustainable forest management and agroecology). However, in most cases, it is difficult to evaluate the extent to which these are being used, owing to the variety of scales and contexts involved and the absence of information on the application of practices. Although the impacts of BFA-focused practices on BFA are generally perceived to be positive, there is clearly a need for more research and for the development of appropriate assessment methods in this regard.

[Possible] Actions

Genetic resources for food and agriculture

1.1.1 Promote the implementation of the sectoral global plans of action to improve the characterization, assessment and monitoring of the respective genetic resources, as appropriate.

Associated biodiversity and ecosystem services

1.1.2 Improve understanding of the effects of particular drivers (including climate change) on population sizes and distributions of associated biodiversity and on the ecological relationships that underpin the supply of ecosystem services.

1.1.3 Identify priority species, ecosystems and ecosystem services, as relevant, for assessment and monitoring at national level.

1.1.4 Identify responsibilities for assessment and monitoring of associated biodiversity and their ecosystem services. This could involve mandating a national agency (e.g. from the agriculture or environment sectors, or both) to collect data and undertake monitoring activities.

1.1.5 Use, to the extent feasible, existing monitoring systems (e.g. those developed for the Sustainable Development Goals [SDGs], Convention on Biological Diversity [CBD] or the Commission) and existing data and indicators at national level and explore the potential of indicators that serve multiple purposes.

1.1.6 Taking into account relevant international initiatives and existing tools and methodologies, strengthen existing and/or develop new tools, standards and protocols for data collection, inventory, assessment and monitoring.

1.1.7 Integrate existing national monitoring systems (e.g. those developed for the SDGs, CBD or the Commission) into an overarching framework for BFA, with a view to improving the assessment and monitoring of BFA by making full use of all existing data and indicators at national level.

Integrated management

1.1.8 Develop tools for data collection and methodology for their analysis, knowledge management systems and methods for exchange and dissemination of BFA-related knowledge, including on its integrated management, in a participatory way.

1.1.9 Improve the availability of the data needed to monitor the extent to which management practices and approaches are being used, taking into account traditional knowledge.

1.1.10 Develop and apply methods, including proxies, to assess the impact of management practices on BFA and the provision of ecosystem services.

PRIORITY AREA 2: MANAGEMENT OF BIODIVERSITY FOR FOOD AND AGRICULTURE

Introduction

Managing the capacity of BFA to supply various ecosystem services involves a range of activities at a range of levels (from genetic and species to landscape or seascape levels). These activities involve the sustainable use and the conservation of BFA.

In the case of BFA, “use” includes the various practices and activities involved in cultivating or raising domesticated species, the implementation of formal or informal genetic-improvement activities and the domestication of additional wild species, the introduction of domesticated or wild species into new production systems, the management of wild species and associated biodiversity and their habitats in and around production systems to promote the delivery of ecosystem services, and the harvesting of food and other products from the wild.

The term “sustainable use” applied to associated biodiversity involves two main areas: (a) the management *in situ* of all BFA to maintain the diversity of organisms and their interactions to ensure the continued provision of ecosystem services, and (b) the targeted domestication and selection of species to improve the delivery of ecosystem services. It is widely acknowledged that the management of diversity, including habitats for associated biodiversity species, contributes to building resilient production systems and livelihoods, promoting food security and nutrition and sustainably intensifying food and agricultural production. With a few exceptions, selection and genetic improvement do not focus on associated biodiversity species.

Numerous management practices and approaches applied at farm, tree-stand or other production unit level, or at ecosystem, land or seascape levels, are considered to be of positive influence on the sustainable use and conservation of BFA. At the same time, the principal drivers of change at production-system level that negatively impact BFA and associated ecosystem services are related to management practices, including changes in land and water use and management, pollution and overuse of external inputs, and overexploitation and overharvesting of resources. The development, adoption and implementation of BFA-focused practices and approaches, and the mitigation and avoidance of negative ones, face several challenges. For one, while each component of BFA – from individual genes and species of plants, animals and micro-organisms to entire ecosystems – is important, it does not exist in isolation and must, therefore, be managed as part of the wider landscape or seascape. This requires, *inter alia*, bringing together and engaging the diverse stakeholders operating within the respective landscape or seascape.

Other priorities for the management of BFA could include:

- i) promoting activities to strengthen and maintain traditional knowledge that contributes to the sustainable management of BFA. Much knowledge has already been lost without ever having been documented, and this loss is ongoing as the use of traditional practices dwindles;
- ii) maintaining areas of natural or semi-natural habitat within and around production systems, including those that are intensively managed, where necessary restoring or reconnecting damaged or fragmented habitats;
- iii) addressing specific threats such as invasive alien species or particular unsustainable practices in agriculture, forestry, fisheries or aquaculture; and
- iv) promoting and expanding the development, adoption and implementation of ecosystem or landscape/seascape approaches in the management of production systems to ensure the supply of ecosystem services and improve livelihoods.

In the context of BFA, *in situ* conservation comprises measures that promote the maintenance and continued evolution of biodiversity in and around crop, livestock, forest, aquatic and mixed production systems. *Ex situ* conservation comprises the conservation of components of BFA outside their normal habitats in and around production systems. This may involve the maintenance of live organisms at sites such as botanical gardens, *ex situ* stands, aquaria, field

gene banks, zoos or rare-breed farms, or storage of seeds, pollen or vegetative plant tissues or cryoconserved materials, such as animal semen or embryos, in genebanks.

Priorities for the conservation of GRFA have been agreed by the Commission in the sectoral global plans of action. In general, *ex situ* conservation has made progress in the past decade in all sectors of GRFA, while *in situ* and on-farm conservation face greater challenges, including those related to economic drivers.

In view of the above, inadequate funding and a lack of trained personnel are common resource constraints, as is a lack of technical resources. Where human resources are concerned, weaknesses are particularly noticeable in taxonomy and systematics. The lack of an interdisciplinary approach in research hampers efforts to improve conservation methods and strategies. A lack of resources makes it more difficult to bridge knowledge gaps of the kind described above, and constrains programme implementation or prevents effective enforcement of regulations aimed at protecting biodiversity. Conservation-related education, training and awareness-raising activities for stakeholders at all levels from producers to policy-makers need to be strengthened.

The other main category of constraints comprises weaknesses in legal, policy and institutional frameworks and/or their implementation. The provision of regulating and supporting ecosystem services and the conservation of the associated biodiversity that underpins them are not sufficiently mainstreamed into policies targeting the various sectors of food and agriculture and those addressing other sectors of the economy. There is also limited focus on associated biodiversity in general biodiversity-related policy frameworks. In countries that have developed relevant policies and laws, these are often not properly implemented.

Lack of collaboration and coordination between stakeholders is another widely recognized constraint. Generally, there is a lack of cross-sectoral coordination, including at policy level. There are constraints associated with a lack of adequate links between ministries, between researchers and policy-makers and between policy-makers and producers or local communities.

Priority 2.1 Promote integrated approaches to the management of biodiversity for food and agriculture

Rationale

A wide range of management practices and approaches can be identified that make use of various components of BFA and therefore contribute to its maintenance and enhanced use, within and outside production systems. Associated biodiversity, in particular, is often managed indirectly rather than through specific actions targeting its sustainable use or conservation.

Management approaches for BFA range in scope from the landscape or seascape to the production system or the individual plot. Landscape and seascape approaches and integrated land- and water-use planning have been adopted, at least to some extent, in numerous countries. Sustainable forest management, the ecosystem approach to fisheries and aquaculture, agroecology and restoration practices are also applied in many countries. At production system level, specific practices related to the diversification of production systems, and specific management practices and production approaches, may promote the sustainable use and conservation of BFA. Such approaches and practices should be more widely applied. However, a lack of research and knowledge, capacity and resources and enabling frameworks makes their adoption and implementation difficult.

Many of the management practices and approaches that make use of various components of BFA are relatively complex and require a good understanding of the species composition of the ecosystem, the functions of these species within the ecosystem and the trophic relationships among them. Such practices and approaches can be knowledge-intensive, context-specific and provide benefits in the long term rather than the short term. Technical and policy support, as well as capacity development, are needed to overcome these challenges and promote wider implementation.

[Possible] Actions*Genetic resources for food and agriculture*

2.1.1 Promote the implementation of the sectoral global plans of action to improve the sustainable use of the respective genetic resources.

Integrated management

2.1.2 Promote sustainable food and agricultural production practices and approaches that make use of, conserve and restore BFA while improving livelihoods and supporting economic performance and environmental health.

2.1.3 Take into account drivers of change that negatively affect BFA and associated ecosystem services when developing or implementing integrated approaches to the management of BFA.

2.1.4 Promote research, including participatory research, on management practices and approaches that make use of various components of BFA.

2.1.5 Identify best management practices (including those based on traditional knowledge) that contribute to the increased sustainable use and conservation of BFA and develop guidelines and tools to facilitate their implementation, as appropriate.

Priority 2.2 Improve conservation of biodiversity for food and agriculture**Rationale**

Conservation systems for GRFA exist, albeit with regional differences in their coverage and effectiveness, and priorities for their conservation have been agreed by the Commission in the sectoral global plans of action. There are many challenges to the conservation of associated biodiversity, including a lack of adequate information on methods and strategies for both *in situ* and *ex situ* conservation. Especially with respect to *ex situ* conservation, there are still biological and technical barriers to the long-term conservation of some species, for example those that cannot be cultured. Another practical constraint is the difficulty of targeting individual associated biodiversity species for conservation programmes. In many cases, it may prove more efficient to prioritize conservation methods and approaches targeting ecosystems than those targeting individual species.

Priorities for action in other priority areas include addressing the underlying knowledge, resource and policy-related constraints to the establishment of effective conservation programmes for associated biodiversity. With respect to conservation activities and strategies *per se*, priority should be given to expanding the use of *in situ* conservation via biodiversity-friendly management practices in agriculture, forestry, fisheries and aquaculture, including, where relevant, traditional management practices associated with local or indigenous communities. It is important in this context to improve landscape structure to provide habitats for associated biodiversity species. Intercommunity and intracommunity, as well as intergenerational transfer of knowledge and skills that enable continued conservation, development and sustainable use of BFA and its related ecosystem functions, should be promoted.

[Possible] Actions*Genetic resources for food and agriculture*

2.2.1 Promote the implementation of the sectoral global plans of action to improve the *in situ*, on-farm and *ex situ* conservation of the respective genetic resources.

Associated biodiversity and ecosystem services

2.2.2 Identify priority species, ecosystems and ecosystem services for conservation at national level and establish targets or goals relative to these priorities.

2.2.3 Strengthen conservation programmes, in particular *in situ* or on-farm conservation, which may be more effective for many types of associated biodiversity and wild foods, and seek to

optimize complementarity between *in situ* and *ex situ* conservation approaches, where appropriate.

2.2.4 Promote conservation through a combination of traditional management practices and innovative technologies, as appropriate, and improve their use for characterization, collection, storage, documentation or data management.

2.2.5 Establish or strengthen effective infrastructure, including at local level, for the conservation of micro-organism, invertebrate and other associated biodiversity species, and improve documentation and overviews of collections within countries.

2.2.6 Create and strengthen networks, including at national and regional levels, linking users and communities that maintain associated biodiversity and ecosystem services on-farm and *in situ*, research institutes, scientists and other relevant stakeholders.

Integrated management

2.2.7 Promote multipurpose production systems managed for both sustainable use and conservation of BFA, such as multiple-use forests.

2.2.8 Develop or expand designated areas, such as protected areas (including International Union for Conservation of Nature Categories 5 and 6) and other effective area-based conservation measures for BFA and related ecosystem services, as well as Globally Important Agricultural Heritage Systems and areas recognized for origin-linked products (e.g. geographic indications).

PRIORITY AREA 3: INSTITUTIONAL FRAMEWORKS FOR BIODIVERSITY FOR FOOD AND AGRICULTURE

Introduction

In developing countries in particular, increasing demand for food production is driving rapid structural change in agriculture sectors, often related to land-use change and habitat degradation and fragmentation. Proper policies and management frameworks, including spatial and physical planning, are essential to ensure the conservation of BFA and the provision of ecosystem services, sustainable production and human well-being and health.

In addition to developing national planning capacity, popular awareness of the importance of BFA needs to be increased in order to promote investments in the sustainable management of BFA. In many instances to date, agriculture-sector development has focused on the promotion of intensification packages that depend on external inputs, rather than on improving management of associated biodiversity to promote the supply of regulating and supporting ecosystem services.

As noted under Priority Area 1, one of the major constraints to the development, adoption and implementation of policies for the sustainable use and conservation of BFA is the significant lack of data on the characteristics of ecosystems and limited understanding of ecosystem functions and services, and specifically the roles of BFA in this context.

As noted under Priority Area 2, other constraints include weaknesses in legal, policy and institutional frameworks. Regulating and supporting ecosystem services, and the conservation of the associated biodiversity that underpins their supply, are insufficiently mainstreamed into sectoral policies, both within food and agriculture and beyond. General biodiversity-related policy frameworks usually give limited attention to associated biodiversity. Where relevant policies and laws exist, their implementation is often inadequate. Lack of consultation between policy-makers at national or regional levels and stakeholders at local level is leading to a disconnection between political and operational levels.

Producers in all agriculture sectors rely on BFA. Despite their significance to BFA management, small-scale and indigenous producers – including women – are often marginalized and excluded from decision-making processes that affect their production systems. Many producers' and community-based organizations play significant roles both in providing practical support to the sustainable management of BFA and in advocating policies or marketing strategies that support the roles of small-scale producers as custodians of BFA.

Many small-scale producers depend on communal resources for their livelihoods. Social and economic policies need to aim at ensuring equity for rural populations, so that they are enabled to build up, in a sustainable way, their productive capacity to supply goods and services in increasing quantity and of increasing quality to expanding national economies. This includes regulating and supporting ecosystem services for clean water, fresh air and healthy soils, for which no market exists in many countries.

Economic valuation tools can help to make the hidden benefits and costs of biodiversity and biodiversity loss more visible, increasing awareness of the need for conservation and driving more effective conservation policies, including incentive schemes. However, quantifying the values of ecosystem services and biodiversity is often challenging because of the difficulty and cost of data collection, the complexity of the ecological processes involved, and geographical and cultural differences in how biodiversity and the benefits it provides are perceived. A number of country reports highlight the importance of valuation studies, but note that major knowledge gaps remain.

In many countries, the market for certified products with health-promoting attributes or products that comply with environmental or social standards can be expected to increase. Such increased consumer demand provides opportunities for producers to combine income generation with biodiversity-friendly production. An increased share of high-value products, linking back to specific biodiversity-friendly production practices, may contribute to the sustainable use of BFA. Cultural identity, often expressed in terms of food preferences, can provide a basis for a growing

awareness of the value of BFA, including for small producers and currently marginal communities.

Incentives for the sustainable use and conservation of BFA can take a range of forms and originate from public programmes, private-sector investments or civil-society initiatives. Incentive measures are still often absent and where they do exist a lack of coordination in their implementation often hampers success. Combining a range of incentive measures into an integrated package may promote the sustainable use and conservation of BFA.

As noted under Priority Area 2, constraints include a lack of collaboration and coordination between stakeholders. Coordination within and beyond agriculture sectors, including at policy level, is generally weak. Gaps in this regard include a lack of adequate links between ministries, between researchers and policy-makers and between policy-makers and stakeholders at production-system and community levels. The integrated management, sustainable use and conservation of BFA cross the conventional organizational and administrative boundaries between sectors, nationally, regionally and internationally.

In a time of rapid change and growing privatization, national planning will need to ensure the long-term supply of public goods, including biodiversity maintenance and ecosystem services, such as clean air and secure water supplies, and human health. Such national planning will inevitably lead to trade-offs between different national policy goals. Short- and long-term policies for the sector, integrated within the larger cross-sectoral planning framework for the achievement of the SDGs, are required.

Priority 3.1 Build capacity through awareness raising, research, education and training

Rationale

Research, education and training, at all levels, are widely recognized as key means of promoting the sustainable management of BFA. As described in Priority Areas 1 and 2, despite their vital contributions to food and agriculture, knowledge of the many components of BFA, ecosystem services and the impacts of drivers and management practices and approaches needs to be improved to better guide decision-making.

In many developing countries in particular, a lack of human capacity and financial resources is a major obstacle to developing the necessary institutions and to planning and implementing a strategic approach to managing, sustainably using and conserving BFA. For this reason, and in order to achieve these objectives, many countries will need to devote particular attention to establishing and building up relevant institutions, adopting and implementing appropriate policies and effective regulatory frameworks and building a strong and diverse skills base, including in taxonomy and through citizen science.¹⁷

Education and training in order to build sustainable capacity in all priority areas are required. Research at national and international levels in all aspects of BFA management needs to be strengthened. The support of agricultural research, for example National Agricultural Research Systems (NARS) and research networks on associated biodiversity, is crucial in this context.

[Possible] Actions

Genetic resources for food and agriculture

3.1.1 Promote the implementation of the sectoral global plans of action to raise awareness of the roles and values of GRFA, and build capacity to strengthen research, education and training for their sustainable use and conservation, as appropriate.

Associated biodiversity and ecosystem services

3.1.2 Raise awareness at the national level of the importance of associated biodiversity and ecosystem services, and of the need for their sustainable use and conservation, among farmers,

¹⁷ Citizen science refers here to the collection of data relating to biodiversity by the general public.

livestock keepers, fisherfolk, forest dwellers, the wider public, donors, policy-makers, the private sector, consumers, children and youth and the media.

3.1.3 Support regional and international campaigns to raise awareness of the importance of associated biodiversity and the ecosystem services it provides, and of the need for its sustainable use and conservation, with a view to strengthening support from governments, institutions and other relevant stakeholders.

3.1.4 Improve capacity for research on associated biodiversity and ecosystem services and encourage the formation of multidisciplinary research teams. Promote innovative ways of building capacities, such as through the use of information and communication technologies.

3.1.5 Strengthen cooperation and synergies in research on associated biodiversity and ecosystem services and other components of BFA and improve the transfer of research outputs to producers and policy-makers.

Integrated approaches

3.1.6 Strengthen the teaching of taxonomy, soil science, ecology, systems biology and other cross-sectoral subjects relevant to BFA in universities, schools and in professional and informal education targeting various stakeholders, including citizen scientists.

3.1.7 Integrate BFA issues into education and training so as to promote interdisciplinary skills among practitioners.

3.1.8 Promote opportunities for ongoing training and education for farmers, fisherfolk, livestock keepers and forest dwellers, including via farmer field schools, producer group extension programmes or community-based organizations, to strengthen the sustainable use and management of BFA and the ecosystem services it supports.

3.1.9 Strengthen research-related policy frameworks to ensure support for long-term research activities, and increase the availability of human, physical and financial resources for this purpose.

3.1.10 Incentivize, through various means (e.g. increasing recognition, including through adequate remuneration, providing adequate infrastructures, such as laboratories, and logistical support), education and research in the field of biodiversity.

Priority 3.2 Strengthen legal, policy and incentive frameworks

Rationale

Appropriate legal and policy frameworks are essential for the effective management of BFA, but often remain underdeveloped or poorly implemented. Improving such frameworks is challenging, particularly in view of the multiple stakeholders and interests involved and the need for provisions to keep up with emerging issues in BFA management. Laws and policies beyond the field of BFA management with indirect or unintended effects on BFA are also often overlooked. With regard to associated biodiversity and ecosystem services in particular, a lack of adequate coordination between the food and agriculture and nature conservation sectors and limited understanding of these components of biodiversity and of their significance to food and agriculture among policy-makers are major constraints to the development of adequate laws and policies.

The importance of valuation of biodiversity and ecosystem services is widely recognized. Nevertheless, the integration of the results of valuation studies into national accounting systems or into broader measures of social welfare is limited. Valuation data could play a more prominent role, *inter alia* in the development of conservation strategies and research programmes. Overall, valuation efforts for BFA and ecosystem services still need to fill major knowledge gaps, including, for example, with respect to microbial genetic resources, wild pollinators and wild medicinal plants.

In terms of the use of incentive programmes, countries often use individual incentive schemes rather than approaches based on multiple incentive measures. While individual public programmes, private-sector investments or civil-society initiatives may provide incentives related to their own particular purposes, a coordinated package of measures can create a much larger impact in terms of improving outcomes for BFA. Challenges to the establishment of multiple-incentive programmes include the need for a suitable enabling environment to support the high level of coordination required between institutions and across scales (international, national and subnational), the need to engage with the private sector and promote responsible investment, and the need for cross-sectoral dialogue, i.e. among the environmental, food and agriculture production and other sectors in the food system. Overall, there is also a need to better document and map incentive schemes.

[Possible] Actions

Genetic resources for food and agriculture

3.2.1 Promote the implementation of the sectoral global plans of action to strengthen institutions and policy frameworks for GRFA, as appropriate.

Integrated approaches

3.2.2 Develop coherent cross-sectoral policies and programmes for the management, sustainable use and conservation of BFA at national and regional levels, addressing the various sectors of GRFA, ecosystem services, associated biodiversity and wild foods and establishing systems or mechanisms that provides integrated and multisectoral support.

3.2.3 Adapt existing or develop new legislation or policies to counter drivers of change that negatively affect BFA and associated ecosystem services.

3.2.4 Mainstream BFA into existing national policies, programmes and strategies on biodiversity (e.g. National Biodiversity Strategies and Action Plans [NBSAPs]) and into those with a possible impact on BFA, for example through the establishment of cross-sectoral (interministerial) and multi-stakeholder working groups (taking into account existing efforts, as relevant).

3.2.5 Encourage relevant international organizations to consider the importance of BFA and the ecosystem services it supports when revising global agreements on biodiversity.

3.2.6 Inventory and review existing legislative, administrative and policy measures on the management, use and conservation of – and access to and exchange of – BFA, their implementation and the extent of their (negative or positive) impacts on the sustainable use of BFA. Where gaps are identified, strengthen or develop such measures, as appropriate.

3.2.7 Develop and standardize valuation methodologies and tools for BFA and ecosystem services.

3.2.8 Conduct assessments, including participatory assessments, of the use and non-use values of BFA, in particular ecosystem services, associated biodiversity and wild foods, building as far as possible on existing information and assessments.

3.2.9 Document and map existing incentive schemes for the improved management of BFA across environmental and food and agriculture sectors and public, non-governmental and private-sector stakeholders.

3.2.10 Strengthen and establish national policies, strategies and frameworks that provide support, including through incentives, to producers and other value-chain actors in applying practices that favour the maintenance and sustainable use of BFA and ecosystem services, in particular indigenous and local production system stakeholders. Relevant incentives and support in this context may include the provision of extension services, delivery of microcredit for women in rural areas, appropriate access to natural resources and to the market, resolving land-tenure issues, recognition of cultural practices and values, and adding value to their specialist products.

3.2.11 Strengthen policy and institutional frameworks for integrating the outcomes of valuation studies into incentive schemes and conservation strategies.

3.2.12 Improve coordination in the management of incentive schemes between the environment and food and agriculture sectors and between public-sector, non-governmental and private-sector stakeholders.

3.2.13 Enhance cooperation between the different actors in the value chain, and, where possible, promote short value chains and diverse retail infrastructures to strengthen the linkages between farmers, markets and consumers.

3.2.14 Raise consumer awareness, including by supporting marketing that encourages consumers to make responsible and sustainable purchasing choices.

3.2.15 Further develop markets and value chains for products from production systems that favour the maintenance and sustainable use of BFA (e.g. through labelling, certification, traceability, denomination of origin, geographic identification, branding, gastronomy and tourism) and promote the use of local/traditional foods to improve nutrition and health.

Priority 3.3 Cooperation and funding

Rationale

The management of BFA spans the conventional boundaries between the sectors of food and agriculture and those between food and agriculture and nature conservation. Strengthening the sustainable use and conservation of BFA often requires actions on a large geographical scale (e.g. across watersheds or along migration routes) and involving a wide range of different stakeholders. The distributional ranges of associated biodiversity species often cross national boundaries. Global challenges such as climate change and emerging disease threats require global responses. Multi-stakeholder, cross-sectoral and international cooperation in BFA assessment, monitoring and management is therefore vital.

Cooperation within and between countries is needed in order to develop national and regional networks. Networks are important in linking stakeholders, and in supporting research, institutional development and capacity building. In some countries where networks are well developed, they draw upon the support of active non-governmental organizations, including from the environment sector, and consumers. National Focal Points for BFA – established for the development of country reports on the state of BFA – could become key agents of change through which networks for the management of BFA could be built and maintained.

Numerous regional and international collaborative initiatives target the sustainable use and conservation of crop, livestock, forest and aquatic genetic resources. While a number of subregional, regional and international organizations and partnerships contribute to the management of specific components of associated biodiversity, including through projects targeting pollinators or biological control agents or *ex situ* collections, far fewer such efforts target the management of associated biodiversity or its role in providing ecosystem services to food and agriculture.

Besides lack of political will and/or governance, capacity, awareness, knowledge and cooperation, lack of financial resources is one of the major constraints to the effective implementation of all actions listed in all three priority areas for the sustainable use and conservation of all BFA.

[Possible] Actions

Cooperation

3.3.1 Inventory and describe relevant institutions and their mandates to enable the development of coordination mechanisms for the establishment of, for example, a national BFA steering committee to strengthen collaboration between relevant institutions, seek synergies and coordinate the implementation of their respective activities.

3.3.2 Improve multi-stakeholder cooperation between producers, researchers, consumers and policy-makers, within the sectors of agriculture and between agriculture and other sectors, in order to reduce the gap between policies and reality on the ground.

3.3.3 Establish new and promote existing national, regional or global networks linking scientists and researchers to improve information sharing.

3.3.4 Further develop and strengthen international cooperation to mainstream BFA within and beyond agriculture sectors.

3.3.5 Ensure special attention is given to sustainable smallholder agriculture, and to the role of women as knowledge keepers for BFA, across priority areas and actions, as appropriate.

Funding

3.3.6 Explore opportunities, and where possible establish fund-raising mechanisms and integrated investment plans, for research, training and capacity development on – and assessment and monitoring, sustainable use and *in situ* and *ex situ* conservation of – BFA and ecosystem services.

3.3.7 Identify opportunities for efficient use of resources, for example by promoting synergies and cooperation between projects at national and regional levels.

3.3.8 Support the funding strategies for the Commission's sectoral global plans of action and the implementation of its Multi-year Programme of Work.

ANNEX 1

Table 1. Concepts used in this document.

Biodiversity			Biological diversity (often referred to as biodiversity) is defined in Article 2 of the Convention on Biological Diversity (CBD) as “the variability among living organisms from all sources including, <i>inter alia</i> , terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems”. ¹⁸
Biodiversity for food and agriculture (BFA)			BFA is a subcategory of biodiversity taken for the purposes of <i>The State of the World’s Biodiversity for Food and Agriculture</i> report to correspond to “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 agricultural products”. Production systems are here taken to include those in the crop, livestock, forest, fishery and aquaculture sectors.
Components of BFA			BFA includes plant, animal and aquatic genetic resources for food and agriculture, forest genetic resources, micro-organism and invertebrate genetic resources, associated biodiversity and wild foods.
	Genetic resources for food and agriculture	Plant genetic resources for food and agriculture (PGRFA)	The term PGRFA refers to genetic material of plant origin of actual or potential value for food and agriculture. ¹⁹ These include farmers’ varieties/landraces maintained on-farm, improved varieties, breeding materials in crop improvement programmes, genebank accessions (i.e. <i>ex situ</i> collections), crop wild relatives and wild plants harvested for food.
		Animal genetic resources for food and agriculture (AnGR)	AnGR are genetic resources of animal origin used or potentially used for food and agriculture. ²⁰ In line with the scope of previous global assessments, ²¹ the term is used in this document to refer to the genetic resources of domesticated avian and mammalian species used in food and agriculture.

¹⁸ CBD. 1992. *Convention on Biological Diversity*. Montreal, Canada, Secretariat of the Convention on Biological Diversity.

¹⁹ FAO. 2010. *The Second Report on the State of the World’s Plant Genetic Resources for Food and Agriculture*. Rome (available at <http://www.fao.org/docrep/013/i1500e/i1500e.pdf>).

²⁰ FAO. 2007. *The State of the World’s Animal Genetic Resources for Food and Agriculture*. Rome (available at <http://www.fao.org/3/a-a1260e.pdf>); FAO. 2007. *The Global Plan of Action for Animal Genetic Resources and the Interlaken Declaration*. Rome (available at <http://www.fao.org/docrep/010/a1404e/a1404e00.htm>).

²¹ FAO. 2007. *The State of the World’s Animal Genetic Resources for Food and Agriculture*. Rome (available at <http://www.fao.org/3/a-a1260e.pdf>); FAO. 2015. *The Second Report on the State of World’s Animal Genetic Resources for Food and Agriculture*. Rome (available at <http://www.fao.org/3/a-i4787e.pdf>).

	Forest genetic resources (FGR)	FGR are the heritable materials maintained within and among tree and other woody plant species that are of actual or potential economic, environmental, scientific or societal value. ²²
	Aquatic genetic resources for food and agriculture (AqGR)	AqGR are the genetic resources of aquatic animal and plant species used or potentially used in fisheries or aquaculture and the biodiversity of the associated ecosystems that support them. The scope of the global assessment undertaken for the forthcoming report on <i>The State of the World's Aquatic Genetic Resources for Food and Aquaculture</i> is farmed aquatic species and their wild relatives within national jurisdiction. ²³
	Micro-organism and invertebrate genetic resources for food and agriculture	Micro-organism and invertebrate genetic resources for food and agriculture are a major component of associated biodiversity. Important groups include pollinators, in particular honey bees, micro-organisms of relevance to ruminant digestion, food processing and agro-industrial processes, biological control agents and soil micro-organisms and invertebrates. ²⁴
	Associated biodiversity	<p>Associated biodiversity is a subcategory of biodiversity for food and agriculture that consists largely of non-domesticated species. Exceptions include the domestic honey bee, some other pollinator species and various biological control agents (natural enemies used to control pest species) that are bred in captivity. Where ecosystem services (see below) are concerned, associated biodiversity is particularly important to the supply of supporting and regulating services. Associated biodiversity species may also be direct sources of food and other products (provisioning ecosystem services) or have cultural significance (supply cultural ecosystem services).</p> <p>The concept is perhaps most familiar in the crop sector, where the biodiversity of harvested domesticated crop plants is distinguished from “crop-associated biodiversity” – the range of other species present in and around the production system that sustain ecosystem structures, functions and processes. Examples include pollinators, the predators of crop pests, the vegetation found in hedgerows and at field margins, and the invertebrates and micro-organisms that create and maintain the soil and its fertility. In addition to beneficial species such as pollinators, crop associated biodiversity includes the various species that inhibit crop production by acting as weeds or pests.</p> <p>In a livestock production system, for example, the domesticated animals can be distinguished from</p>

²² FAO. 2014. *The State of the World's Forest Genetic Resources*. Rome (available at <http://www.fao.org/3/a-i3825e.pdf>).

²³ FAO. forthcoming. *The State of the World's Aquatic Genetic Resources for Food and Agriculture*. Rome.

²⁴ CGRFA/16/17/Report Rev.1, paragraph 79.

		<p>associated biodiversity such as rangeland plants, the micro-organism and invertebrate communities associated with these plants and with the soil, and the micro-organisms found in the animals' digestive systems. In a forest ecosystem, trees are surrounded by a multitude of plants, animals and micro-organisms that contribute in various ways to the functioning of the ecosystem. In capture fisheries, harvested species rely on a range of animals and plants and micro-organisms as sources of food and for services such as water purification and waste treatment. They benefit from oxygen provided by aquatic plants and the protection provided by habitats such as kelp forests, seagrass beds and coral reefs. Some species rely on others as hosts. Aquatic species farmed in extensive systems or raised in culture-based fisheries also interact with these various components of associated biodiversity. Similarly, species raised in aquaculture ponds benefit from a range of services provided by the flora and fauna that surround them, particularly with respect to water purification and nutrient cycling.</p> <p>Management of associated biodiversity encompasses a wide range of different intensities. Many components of associated biodiversity are not, in any deliberate way, managed to promote their role in supplying ecosystem services to food and agriculture (or subject only to broad measures targeting whole ecosystems). In other cases, habitats in and around production systems are deliberately managed in order to promote the presence of associated biodiversity species and thereby increase the supply of the ecosystem services they provide (e.g. management of hedgerows and field margins to support pollinators). In yet other cases, associated biodiversity species are deliberately introduced into production systems (e.g. introduction of biological control agents to address pest problems or soil micro-organisms to support plant nutrition).</p>
	Wild foods	<p>Wild foods are food products obtained from non-domesticated species. They may be harvested (gathered or hunted) from within food and agricultural production systems or from natural or semi-natural ecosystems. The group of species that supplies wild foods overlaps to various degrees with those in the above-described "sectoral" categories of genetic resources. In the aquatic sector, the majority of production comes from wild foods and many aquaculture facilities use wild-caught stocks for broodstock or larval grow-out. Capture fisheries are probably the largest single example of the human use of wild foods.</p>
	Ecosystem services	<p>Components of BFA provide ecosystem services. Ecosystem services are "the benefits humans derive from ecosystems".²⁵ The Millennium Ecosystem Assessment</p>

²⁵ MA. 2005. *Ecosystems and human well-being: synthesis*. Washington DC, Island Press.

	<p>identified four categories of ecosystem service: provisioning, regulating, supporting and cultural. “Provisioning services” are “the products obtained from ecosystems”, i.e. food and raw materials of various kinds. “Regulating services” are “benefits obtained from the regulation of ecosystem processes”. Examples include regulation of the climate, air and water quality, diseases and natural disasters. “Cultural services” are the “nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences”. “Supporting services” are services “that are necessary for the production of all other ecosystem services”. Examples include photosynthesis and nutrient cycling. The distinguishing feature of supporting services is that they have a less direct effect on human welfare.</p>
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