COUNTRY REPORTS

THE STATE OF **ZAMBIA'S** BIODIVERSITY FOR FOOD AND AGRICULTURE

	منظمة الأغذية والزراعة للأمم المتحدة	联合国粮食及农业组织	Food and Agriculture Organization of the United Nations	Organisation des Nations Unies pour l'alimentation et l'agriculture	Продовольственная и сельскохозяйственная организация Объединенных Наций	Organización de las Naciones Unidas para la Alimentación y la Agricultura

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

November 30, 2013

COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Country: Zambia

National Focal Point: Dickson Ng'uni

INSTRUCTIONS FOR DYNAMIC GUIDELINES

How do I complete the dynamic guidelines?

1. You will require Adobe Reader to open the dynamic guidelines. Adobe Reader can be downloaded free of charge from: http://get.adobe.com/uk/reader/otherversions/. Use Adobe Reader Version 10 or higher.

2. Open the dynamic guidelines and save it (save as -> pdf) on your hard drive.

3. Please rename it <name of your country>.pdf.

4. You may forward the dynamic guidelines to stakeholders you would like to involve or inform by e-mail. You may also print and/or save the dynamic guidelines.

5. It is advisable to prepare textual responses (including any formatting such as bullet points) first in a separate document and then to copy and paste them into the form. Please use font Arial 10. Acronyms and abbreviations should be avoided if possible. If included, they must be introduced (i.e. written out in full) the first time they are used. Note that the text boxes are expandable. Once text has been entered, the box will automatically enlarge to make its content fully visible when you click outside its border.

6. When you have finished completing the dynamic guidelines, click the “Submit by Email” button on the last page and send the completed dynamic guidelines to SOW-BFA@fao.org. This should automatically attach the document to an email that you can then send. Otherwise, please attach the completed dynamic guidelines manually to an e-mail and send it to SOW-BFA@fao.org. A letter confirming official endorsement by relevant authorities should also be attached to the email.

7. You will receive a confirmation that the submission was successful.

Where can I get further assistance?

Should you have any questions regarding the dynamic guidelines, please address them by e-mail to SOW-BFA@fao.org.

How, by whom and by when must the completed dynamic guidelines be submitted?

Once officially endorsed by the relevant authorities, the completed dynamic guidelines should be submitted (click the “Submit by Email” button on the last page) by the National Focal Point. Completed dynamic guidelines should be sent **by December 31st, 2014**.

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THE ESSENTIAL ROLE OF COUNTRY REPORTS

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

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

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

I. INTRODUCTION

1. The FAO Commission on Genetic Resources for Food and Agriculture (the Commission) is the only intergovernmental forum which specifically deals with the whole range of genetic resources for food and agriculture. Genetic resources for food and agriculture are the building blocks of biodiversity for food and agriculture. The mandate of the Commission covers all components of biodiversity for food and agriculture. To implement its broad work programme and to achieve its objectives through a planned and staged approach, the Commission adopted and subsequently revised and updated its Multi-Year Programme of Work (MYPOW). CGRFA-14/13/Report, *Appendix I*, Table 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 upon by the Commission. CGRFA-11/07/Report 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. CGRFA-14/13/Report, paragraph 14.

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. CGRFA-14/13/Report, paragraph 14.

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. CGRFA-14/13/Report, paragraph 15.

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.

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:
Secretariat
Commission on Genetic Resources for Food and Agriculture
Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla

00153 Rome, Italy
Fax: +39 0657055246
Email: SOW-BFA@fao.org

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.

Zambia is endowed with huge resource base of natural resources and a fairly rich biological diversity manifested in terrestrial and aquatic flora and fauna as well as wide genetic diversity of biodiversity for food and agriculture. The mainstay of Zambia's economy is natural resource-based consisting principally of forestry, fisheries, livestock and crop on which nation's population is directly dependent for their livelihood. The livestock sector production systems are mainly of grassland-based systems (L2) and the landless systems (L6). The forest sector also is in two production systems namely the naturally regenerated forests (F2) based on natural regeneration with minimal or no human intervention and the planted forests (F6) that involve semi natural intensively managed forest establishment or forest plantations that are raised and managed as forest farms from introduced or native species. The aquaculture and fisheries sector is defined by four production systems the self-recruiting capture fisheries (A2), cultural-based fisheries (A6), fed aquaculture (A10) and non- fed aquaculture (A14). The country's crop sector comprises of both the irrigated crops (C6) and the rainfed crop (C10) production systems.

The country has a wide range of cultivated crops which include cereals, legumes, oil crops, roots and tubers, fiber, fruit trees, vegetables and plantation crops. Most of the crops are cultivated in all the three agro-ecological regions of the country. The extent, to which these are cultivated in terms of land area, however, varies across the country and is dependent on suitability factors such as soils, growing season and moisture availability. The total number of cultivated crop species in the country is estimated to be 106 and comparatively has remained the same since the last stock taking exercise that took place fifteen year ago. The proportion of crops categorized as indigenous, which are those domesticated or originating within Africa such as sorghum, millets, cowpea, Bambara groundnuts, sesame and a range of vegetable species are about 15 percent of the total number of cultivated crops. The National Plant Genetic Resources Centre (NPGRC), established in 1989, is a government programme responsible for the conservation as the active collection of both inter and intra specific crop genetic diversity occurring in the country. Since its inception, the NPGRC is currently holding a total of 7,300 accessions as seed samples in its gene bank with some safely duplicated at the SADC Plant Genetic Resources Centre (SPGRC). The conserved germplasm accessions are accessible by users for research and development at national, regional and international levels.

The total interspecies diversity of domesticated livestock at country level is estimated at 16 species. These consist of 10 species of mammals and 6 species of birds. Domesticated mammals are dominated by cattle while birds are dominated by chickens. The country's 82.5 % of the estimated 1,417,992 small-holder farmers own at least one or more types of livestock that include cattle, goats, pigs, sheep, donkey, chicken, guinea fowls, ducks, geese and rabbits. Major cattle rearing regions of the country especially Southern Province have in recent years been adversely impacted by diseases such as corridor disease and anthrax resulting in loss of a number of stocks. Traditional sheep production is concentrated in Southern, Eastern and Luapula provinces, accounting for 63% of the traditional sheep population, which are mainly of indigenous fat-tailed and thin-tailed types. Almost 65% of the total Zambian pig herd consists of pigs from indigenous breeds. The difficulties associated with accessing feeds and drugs has made many rural small pig producers turn to indigenous breeds which in nature demand little

management requirements and tend to be more resistant to diseases than their exotic counterparts.

Forests are known as a valuable natural and economic resource for supporting natural systems and improving peoples' livelihoods. Zambia's forests are also important repositories of biodiversity and provide a wide range of goods for livelihoods especially for the rural poor such as timber and non-timber forest products including, fibre, medicinal plants, edible wild vegetables, edible wild fruits, edible insects, mushrooms and honey. Overall, harvested forest products make a significant contribution to incomes of the rural poor. Forest contribution to rural household income is estimated at 20.6 percent while 83.4 % of the households in Zambia depend on wood resources for their cooking energy and on the overall forest sector contributes at least 6.3% to the GDP. Unfortunately, due to low replacement rates, the increased demand for wood resources has resulted in deforestation whose rate is surpassing 250,000 to 300,000 hectares/year. The situation has been worsened by the increased demand for charcoal especially in the towns and cities which in recent months has been triggered by increased load shedding of hydro generated electricity. This situation is likely to lead to massive bare lands especially that the afforestation rates are comparatively low.

The country is endowed with more than 40% of the fresh water in the southern African region and provides high potential in terms of both inland capture fisheries and aquaculture. The major water bodies that constitute important fisheries in Zambia are Bangweulu, Mweru-Luapula, Mweru-WaNtipa, Barotse Floodplain, Kafue Flood Plains, Lukanga Swamps, Lake Kariba, Lake Tanganyika, and Lake Itezhi- Tezhi. In 2014, the national fish production reached 100,107mt of which inland capture fisheries represented 80.7% while aquaculture stand at 19.3%. Up to 490 fish species have been recorded in these water bodies belonging to 24 fish families, but only about 18 species contribute to commercial fishing for food. About 76% of the recorded fish species are endemic to Lake Tanganyika while almost all the other lakes, rivers/floodplains and swamps have a few endemic fish species which may be caught for food or as ornamental fish although documentation in terms of numbers remains lacking. In general, low water levels due to persistent droughts and other human activities as well as illegal and unsustainable fishing practices contribute to declining fish catches by species at national level.

A number of drivers on biodiversity for food and agriculture attributed both due to the influence human activities and natural causes are responsible for inflicting threats to the biodiversity for food and agriculture. Farmers' preference of the exotic to the local livestock breeds for some livestock species arising mainly from market demands is in part an important factor for narrowing the livestock species diversity in the country. This is more apparent for cattle, pigs and goats. Pests and diseases are the main negative driver of change impacting the livestock genetic resources. This is worsened by the climate change that is leading to the reduced availability of water and altering the distribution range of disease vectors. For example, the current distribution of the main tick vector species (Rhipicephalus appendiculatus) that is involved in the transmission of East Coast fever (Theileriosis) is projected to expand in Zambia. There is a need therefore to expand and intensify surveillance and control activities of this and other vector species in the future to conserve livestock biodiversity.

In respect to forest biodiversity the major drivers of change include deforestation and habitat degradation especially in northern Zambia. In the eastern, central and southern Zambia, conversion of forest land to permanent agricultural purposes is the main driver of forest cover loss. The other direct drivers that have strongly negatively impacting on forest genetic resources are fuel wood harvesting; agricultural expansion; timber extraction; bush fires; and mining and Infrastructure development. Over-harvesting and exploitation of edible orchids, especially for sale, is also threatening some local orchid populations with near or completely extinct from the wild. Indirect drivers affecting forest genetic resources are poverty levels; demographic causes; economic causes; policy and institutional causes; technological causes. The reduced forest biodiversity has impacted negatively on ecosystem services through reduced access to provisioning of services arising from over harvesting of wood and non-wood products for timber, charcoal and fire wood. Consequently, there has been a disturbance in the regulating services for climate and water as well as a decline in the quality of cultural services including aesthetic, educational, recreational and spiritual.

The major drivers of change of the aquaculture and fish biodiversity include aquaculture practices that lead to dominance of introduced invasive fish species such as Oreochromis niloticus, Crayfish (Cherax quadricarinatus) leading to the escaped from aquaculture, habitat modification through dam construction for hydroelectric power supply on the inland gorges which result in destruction of the remaining riverine habitats and fishes of the lower river systems. Overharvesting of the native fish species by local people through use of unauthorized fishing methods. Invasive alien species such as the water hyacinth (Eichhornia crassipes), Kariba weed (Salvinia molesta) and carpet weed (Azolla filiculoides) continue to cause problems in many rivers systems by reducing the water mass of the river. Pollution of the upstream water mass mainly from the national mining activities lead to a reduction in the quality of biodiversity goods or products.

The direct drivers that negatively affect cultivated plants include climate change, replacement of traditional varieties with uniform improved varieties in a way reducing the number of farmers and size of crop fields committed to the landraces. At the same time too the smallholder farmers are the custodians of the broad crop and livestock genetic diversity found in the country. In part, these farmers cultivate and use their own crop varieties that have been locally developed over cycles of selection. International and national policy frameworks that influence agricultural production impact negatively on the existing crop genetic diversity. National policy direction that promote and favour the cultivation and marketing of a selected set of crops and their improved crop varieties have a tendency of negatively impacting on the traditional crop diversity. Invasive alien species such as

Lantana camara and Mimosa pigra that mainly come about through introduction by humans have a tendency to colonize the arable land, aggressively compete with the cultivated crops for soil moisture, nutrients and consequently becoming very invasive and pose threats to ecosystems and their constituent indigenous flora and fauna. With respect to the plants that are gathered and collected from the wild for food such as edible ground orchids, yams and wild mushrooms and hoodia the main negative drivers and stressors of change are unsustainable harvesting or extraction strategies. These are harvested in large quantities because of their increased utilization and commercial value in the urban areas. Climate change has adversely impacted on the plant genetic diversity of both the plant in cultivation and those occurring in the wild as crop wild relatives. It is projected that southern Africa will experience a declining trend in rainfall during the 21st century, there has been little consistent change (trend) in annual rainfall in Zambia; however, variability in annual rainfall remains high and this is likely to continue during most of this century.

The country has initiated a number of national plans, strategies and programmes as actions for the conservation and sustainable utilization of national biodiversity for food and agriculture. The proposed future strategic agenda for the conservation and sustainable use of biodiversity for food and agriculture lies in drawing up an action plan to halt the loss of biodiversity and to implement relevant national environmental goals and targets, including those that are of relevance to agriculture, forestry and fisheries. In order to effectively achieve this set goal, the national plans, strategies and programmes for the conservation and sustainable use of biodiversity for food and agriculture should be nested within the broader framework of the National Biodiversity Strategy and Action Plan (NBSAP). As a living plan, the NBSAP should be revised to bring it in tandem with the goals and targets linked to the Strategic Plan for Biodiversity 2011-2020 (including the Aichi Biodiversity Targets) that provides the overarching framework on biodiversity for the entire United Nations system. It is thus imperative that the relevant national laws and regulations relevant for the agenda of conservation and sustainable use of biodiversity for food and agriculture should be in conformity with international commitments. In turn, the country should work towards bringing the national legislation relevant to access and benefit-sharing of genetic resources in line with the Nagoya Protocol. The nation should increase and sustain its efforts in the area of raising public awareness on the value of biodiversity for food and agriculture to food and nutrition security. National strengthening of the sustainable management of biodiversity for food and agriculture will require research and extensive monitoring, capacity building, mainstreaming conservation and sustainable use of biodiversity for food and agriculture in the national economic development agenda and awareness raising activities for which political commitment and provision of increased and sustained national resources for among other conservation and sustainable use activities, monitoring activities of ecosystems, populations and species of relevance to food and agriculture, as well as data on the linkages between them, need to be strengthened.

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.

Zambia Agriculture Research Institute (ZARI) within the Ministry of Agriculture and Livestock assumed the role of the coordinating institution for the process. In this regard, the National Focal Point (NFP) for the preparation of the country report on the state of biodiversity for food and agriculture was instituted. The preparatory process of the country report involved the engagement of key stakeholders from different sectors including but not limited to plants, livestock, fisheries, forestry, environmental protection, natural resources management, farmers' organizations and other relevant non-governmental organizations that transformed into the national steering committee. This country report is a product arising from national stakeholders' consultation through national meetings and information sharing following closely the FAO guidelines for the preparation of the country reports. The first consultative national steering Committee meeting that was held in May 2015 resulted in the formation of working groups based on five sectors namely Forestry, crops, aquaculture/fisheries, livestock and microorganisms/invertebrates. The second meeting of the working groups held in August 2015 reviewed progress made with regard to completion of the tables as baseline for the compilation of the country report.
The names participants with their affiliations and addresses including all stakeholders consulted are provided below:
1. Mr. Charles Nkhoma, Community Technology Development Trust, Lusaka, Zambia.
2. Mr. Godfrey Mwila , Zambia Agriculture Research Institute, Mount Makulu Research Station, P/B 7, Chilanga, Zambia.
3. Mr. Mbamwai Mbewe, Department of Fisheries, P. O. Box 350100, Chilanga, Zambia.
4. Mr Arthur Nkonde, Biodiversity Community Network, Kabwata, Lusaka, Zambia.
5. Dr. Cyprian Katongo, University of Zambia, Department of Biological Sciences, P.O. Box 32379, Lusaka, Zambia.
6. Ms. Thandie Lupupa, SADC Plant Genetic Resources Centre, Private Bag CH 6, Lusaka, Zambia.
7. Mr Young Vibetti, Department of Livestock Development, Mulungushi House, Lusaka, Zambia.
8. Mr. John Musanya, c/o Mount Makulu Research Station, P/B 7, Chilanga, Zambia.
9. Ms Ireen Lungu-Chipili, Zambia Environmental Management Agency, Corner of Church and Suez Roads, Plot No. 6975, Ridgeway, Lusaka, Zambia.
10. Mr. Keddy Mbindo, Department of Forestry, Lusaka, Zambia.
11. Mr. Graybill Munkombwe, Zambia Agriculture Research Institute, Mount Makulu Research Station, Private Bag 7, Chilanga, Zambia.
12. Dr. Dickson Ng'uni, Zambia Agriculture Research Institute, Mount Makulu Research Station, Private Bag 7, Chilanga, Zambia.

General overview of the country

2. In a few paragraphs, provide a synthetic overview of your country, including the size, location, main physiographic and climatic features. Include a section on human population, providing disaggregated data on women and men 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.

Location of the Country
Zambia is a landlocked country in the Southern region of Africa lying between latitudes 8 -18° south of the Equator and Longitudes 22 – 34° east of the Greenwich Meridian. The country is neighboured by Democratic Republic of Congo to the north, Botswana and Zimbabwe to the south, Malawi and Mozambique on the east, Angola on the west, Tanzania on the northeast and Namibia on the southwest of the country. With the surface land area of 752,614 km2, the topographic of regions of the country are plateaus and valleys. The plateaus stand at altitudes of 1,000 m to 1,500 m above sea level (asl) with occasional high ground 1,500 to 2,000 m in the northeast of the country consisting of mountains in Nyika and Mbala areas. The plateau is also covered by large expanses of floodplains in the north (Bangweulu Swamps), central parts (Kafue Flats) and west (Barotse Floodplain). The valleys (~300 m – 500 m asl) occur along the Luangwa River and middle Zambezi and are separated from the plateaus by escarpments.

Main physiography and climatic features of the country
The country is largely on the broad belt of temperate highlands with the temperature range between 16-27°C in the cool and dry season and 27-38°C in the hot and wet season. There are mainly two major climatic characteristics namely According to the FAO/UNESCO classification, the northern plateau soils in Northern and Copperbelt Provinces and northern parts of Central Province are orthic ferrasols that are strongly leached brownish clayey to loamy soils derived from acidic rocks with a pH of 4.0 – 4.5 while the plateau in the rest of Central Province, Eastern, Lusaka and Southern Provinces have ferraisols that are

moderately leached with a pH of 4.5 – 6.0. The Luangwa and Middle Zambezi valleys have vertisols, luvisols and fluvisols that are slightly acid to alkaline (pH 5.0 – 7.5) and these are separated from plateau soils by lithosols of the escarpment zone. The Kafue Flats in Central and Southern Provinces have clay vertisols that are slightly acidic to alkaline (pH 5.0 – 7.5). In Western Province, the Kalahari sands with a pH of 4.0 – 4.5 cover most of the upland areas in the Province and some parts have strongly acid podzols and arenosols (pH 4.0 – 5.0) while the floodplain soils consist of dystric gleysols and arenosols that are also strongly to very strongly acidic.

The national economy and human demography

The mainstay of the national economy hinges on mining, tourism, agriculture and forestry between them providing the main sources of GDP and most of the current economic growth – and these sectors are all environmentally-dependent in different ways. Together, they have contributed to economic growth at an average of 5.5% per year over the last few years, a huge rise since the 1990s, which averaged just 0.1%. Mining provides 71% of all exports, and a major source of growth, expanding at 9% per year between 2002 and 2005. Copper has continued to be Zambia's major foreign exchange earner, contributing an average 73% to the total export earnings annually (CSO, 2012). Agriculture provides 70% of all livelihoods, if just 17% of GDP and only a 2.6% growth rate. The fastest growing sector has been construction at 18% growth – especially residential and commercial developments in urban areas and mining infrastructure.

The population of Zambia as captured during the 2010 Census of Population and Housing shows that the population increased from 9,885,591 in the year 2000 to 13,093,666 in 2010 representing an annual average growth rate of 2.8 percent and a nominal increase of 32.4 percent (CSO, 2013). At the land area of 752,612 square kilometres, the country's population density increased from 13.1 persons per square kilometer in 2000 to 17.4 persons per square kilometer in 2010. In both 2000 and 2010, Lusaka province had the highest population density and North Western Province had the lowest. The population in rural areas increased from 6,458,729 in 2000 to 7,919,216 in 2010, representing an increase of 22.6 percent between the two censuses (CSO, 2013). The population in urban areas grew by 51.0 percent from a population of 3,426,862 in 2000 to 5,173,450 in 2010.

In terms of composition and distribution, 49.3 percent (6,454,647) of Zambia's population is males while 50.7 percent (6,638,019) is females. Comparatively, a high proportion of Zambia's population 60.5 percent (7,923,289) reside in rural areas and 39.5 percent (5,169,377) were in urban areas (CSO, 2013). The percentage of the urban population increased from 34.7 percent in 2000 to 39.5 percent in 2010, consolidating Zambia's position as one of the highly urbanized countries in Sub Saharan Africa. At Provincial level, Lusaka Province has the largest percent share of the population at 16.7 percent (2,191,225) of the total population. Copperbelt Province is second with 15.1 percent (1,972,317), while Eastern Province is third with 12.2 percent (1,592,661) of the total population. Muchinga Province has the least percent share of the total population at 5.4 percent (711,657).

Contribution of biodiversity for food and agriculture to food and nutrition security

Zambia is endowed with huge resource base of natural resources and a fairly rich biological diversity manifested in terrestrial and aquatic flora and fauna as well as wide genetic diversity of agro-biodiversity. The mainstay of Zambia's economy is natural resource-based consisting principally of forestry, fisheries and agro biodiversity on which nation's population is directly dependent for fuel, food, income, raw materials and medicines. However, the value of ecosystems and the potential of the biodiversity contained therein have not been fully appreciated and treasured at national level. Nevertheless, food and livelihood security of local communities depend on the sustained management of various biological resources that are important for food and income generation from agro-ecosystems which include, harvested crop varieties, livestock breeds, fish species and non-domesticated (wild) resources within field and livestock/ forest rangelands. There are three main categories of farmers in Zambia depending on the scale of production; i) small scale; ii) medium-scale and iii) large-scale. According to estimates by Lubangu and Mofya-Mukuka (2012), the number of small-scale households involved in farming is estimated at 1,417,992 million. In terms of crop production, this category of farmers accounts for about 80 percent of the national staple crop production. The contribution of small scale farmers to livestock production has been around 30%. A small number of commercial or large scale farmers are involved in commercial crop and livestock production. These are responsible for much of wheat, soya bean and sugarcane production for instance, crops that form the backbone of the Zambian agricultural export. The livestock sub-sector is recognised as an increasingly important component of the Zambian agricultural economy contributing about 7 percent to the Gross Domestic Product (GDP). It plays important economic and social roles in the livelihoods of many Zambians, particularly, smallholder farmers. Taking into account its contribution in providing draught power, organic fertilizer and its by-products such as hides and skins, in real value terms, its share to GDP is higher. Despite being a vital resource underpinning food security and livelihoods of people, biodiversity for food and agriculture has not been given adequate attention in terms of management and utilization and is therefore facing threatened with loss. Comparatively, other components of biodiversity such as forestry, wild animals and perhaps fisheries are provided due attention.

Zambia's forests are not only important for their specialized high timber species and fuel wood, they are also important repositories of biodiversity and provide a wide range of goods for livelihoods (especially for the rural poor) such as non-timber forest products including, fibre, medicinal plants, edible wild vegetables, edible wild fruits, edible insects, bush meat, mushrooms, honey, etc. In essence forests are known within the Zambian context as contributing to both food and livelihood security and as a safety net in times of unfavourable agricultural growing seasons (increasingly associated to climate change).

The national biodiversity study (Chidumayo and Aongola, 1997) estimated that one-third of rural households harvest wild food resources in form of fruits, mushroom and root/tubers with a gross annual output of about 31 kg per household. Overally, harvested forest products make a significant contribution to incomes of the rural poor people. Forest contribution to rural household income is estimated at 20.6 percent (Puustjärvi, Mickels-Kokwe and Chakanga, 2005). Most forest product harvesting and sale is seasonal, providing cash income at different times of the year, and few households use only one product. According to Turpie et al. (2014), the income from non-wood forest products (NWFP) is estimated to be around $135.8 million per annum.

Forests have intricate relationships to changing forest landscapes and ecosystems that in turn have implications for biodiversity conservation, agricultural land productivity, energy needs, water needs, water catchment conditions and industrial needs in Zambia. There are a number of key ecosystem services provided by the forests associated with socio-economic development in Zambia. Miombo woodlands on deeper sandy soils are characterized by tall, deep-rooted trees that act as "nutrient pumps". When these deep-rooted plants are removed from the system, the pool of nutrients available in the topsoil may be reduced (Dean et al., 1999). Tree canopy and grass cover intercept rain drops and reduce their power to erode soil particles. Surface litter also plays this protective function in addition to maintenance of soil organic matter (carbon) and nutrient content through decomposition. Soil fertility and quality has implications for the agricultural sector for crop and livestock (fodder) productivity. The capacity of forests to help capture and store water helps to mitigate floods in periods of heavy rains and ensures steady water flow during drier seasons. As an example, Iit has been that For example, revealed that the mass curve for rainfall in the Kafue catchment reported a significant increase in surface water runoff per unit rainfall from the Kafue headwaters region during the 1950s and 1960s (Bleifuss and Do Santos, 2001). These changes were attributed in part to deforestation in the Copperbelt region.

Fresh water wetland ecosystems fish production in Zambia is concentrated in the Northern, Western and Southern parts of the country and along major rivers and lakes. The fisheries sub-sector plays an important role in the economy of the country through the provision of employment and income generation, and contributes to food and nutrition security. The sub-sector contributes about 3.2 percent to national GDP (GRZ, 2013). Current estimates indicate that over three hundred thousand persons directly or indirectly obtain part of their income from the fisheries sector. Fish is a major food item in the diet of Zambians. Fish accounts for 29 percent of the animal protein supply (CSO, 2006). Currently, the sub-sector only produces about 70, 000 metric tonnes of fish per year out of which 87 percent comes from capture fisheries. Wetland ecosystems provide water for different uses by storing water (sponge effect), helping to recharge both surface and groundwater and in the process. Additionally, wetlands improve the quality of water by filtering pollutants and sediments while retaining the nutrients required by and to support the ecosystem thereby improving productivity of wetlands. Floodplains reduce or delay downstream floods. This function arises in part because floodplains provide space for water to spread and in part because the higher hydraulic roughness of floodplains (cf., river channels) reduces the velocity of flow. Evapotranspiration from floodplains may be significant so that total downstream flows may be less than those upstream. For example, the estimated average annual evaporation from the Kafue Flats (947 mm) equates to a total loss of approximately 6,600 mm3y-1 (Mumeka 1992). Wetlands are a major habitat for a number of living organisms key to national economy and livelihoods. Endemic mammal species such as the lechwe breeding cycle is dependent on the health of the Kafue Flats and Bangweulu wetland ecosystems. Bird species such as the wattled crane and a wide range of fish and other aquatic species depend on wetland habitats

The Production systems of the country
Production systems in Zambia are based on four main sectors of biodiversity namely crops, livestock, fisheries and forestry. The overall climatic zone prevailing in the country for all the sectors and production systems is subtropics which is defined by one or more months with monthly mean temperatures, corrected to sea level, below 18 °C but above 5 °C (Table 1).

Generally and broadly categorized, the country has two main livestock sector production systems whether at small scale or commercial scale levels. These production systems are the livestock grassland-based systems (L2) and the livestock landless systems (L6). Similarly, in the forest sector, there are also two production systems i.e. the naturally regenerated forests (F2) based on natural regeneration with minimal or no human intervention. This production system includes naturally regenerated native forest species where either visible indications of human activities or indeed managed intensively as natural forest reserves. The other system, planted forests (F6), involves semi natural intensively managed forest establishment or forest plantations that are raised and managed as forest farms from introduced or native species. The national aquaculture and fisheries sector is defined by four production systems the Self-recruiting capture fisheries (A2), Cultural-based fisheries (A6), Fed aquaculture (A10) and Non- fed aquaculture (A14). Irrigated crops (other): The country’s crops sector has two production systems namely: the Irrigated crops (other) (C6) and Rainfed crops (C10).

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.

Zambia is endowed with huge resource base of natural resources and a fairly rich biological diversity manifested in terrestrial and aquatic flora and fauna. The mainstay of the country's economy is natural resource-based, consisting principally of forestry, fisheries, crop and livestock genetic resources that the nation’s population is directly dependent upon for fuel, food, income, raw materials and medicines. The country has over 100 plant species that are cultivated. Of these, about 15% are indigenous crop species including sorghum, millets, cowpea, bambara groundnuts, sesame and traditional leafy vegetable species such as amaranths, Bidens pilosa (Black jack), Cucumis spp. Cleome gynandra (Cat’s whiskers) and Corchorus spp. (Jute). The traditional leafy vegetables are either under semi-cultivation or gathered from the wild for household food and in some cases for sale. About 75% are exotic species, 7% of which were introduced and have been naturalized to the local condition. The naturalized crops include maize, beans, groundnuts, cassava, sweet potato, mango and avocado pear.

The fisheries sector contributes around 1 percent on average to GDP. Total production from capture fisheries is approximately 65,000 to 80,000 tonnes per annum, with an additional 5,000 mt estimated from the emerging aquaculture sector. Contributions to rural economic growth and commerce provide significant economic opportunities for the poor. Although the fisheries sector provides income for over 300,000 people, such benefits are poorly quantified and often overlooked. The sector's contributions to national food security and public health are likewise largely undervalued. Fish and fish products account for more than 20 percent of animal protein intake and provide essential micro nutrients to the majority of Zambia's population who are highly vulnerable to malnutrition.

Forest resources through non-timber products provide for broad uses for the nutrition and generation of household income for both rural and urban households by generating formal and informal employment. Mushrooms, fruits, leafy vegetables, tubers and insects collected from miombo woodlands are widely consumed by rural households and enrich their starch-based diets with vitamins and minerals. These foods are often available at the start of the rainy season and thereby serve as an important gap-filler when food stocks are low. Furthermore, for many rural women and increasingly those of the urban areas, trade in forest foods is an important source of cash. More than fifty trees bearing edible fruits are found in miombo woodlands. Farmers often acknowledge the value of indigenous fruit trees and retain and protect the trees on their fields. Approximately 25 different edible mushroom species have been documented in Zambia. Women are responsible for collecting mushrooms. A small proportion is consumed fresh while ninety percent is dried. Trade of mushrooms is substantial though volumes traded at national level are unknown. Roots of various species (including Rychosia spp., Eminia spp. and Vigna spp.) are harvested to make "munkoyo", a fermented non-alcoholic beverage upon drying.

In Situ conservation of wild plant genetic resources for food and agriculture indirectly through biodiversity conservation initiatives targeting wildlife and forest genetic resources undertaken by the Zambia Wildlife Authority and Department of Forestry respectively. The in-situ method as a strategy for the conservation of biodiversity for food and agriculture such as useful wild plant species, wild related plant species and local crop varieties remains an important strategy. On-farm conservation activities in Zambia that were initiated as a regional programme in 1998 involving Malawi, Zambia and Zimbabwe spearheaded by SADC Plant Genetic Resources Centre (SPGRC) are on going in Zambia with participation of three piloted communities in Lusaka rural, Central and Southern provinces.

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.

4. Indicate, for each of the production systems listed in Table 1 below, whether it is found in your country or not, regardless of its importance.

Table 1. Production systems present in the country.

Sector	**Code**	**Production system names** (Place pointer on the production system name for a detailed description)	**Check if present in the country**
Livestock	L1	Livestock grassland-based systems: Tropics	☐
	L2	Livestock grassland-based systems: Subtropics	☒
	L3	Livestock grassland-based systems: Temperate	☐
	L4	Livestock grassland-based systems: Boreal and /or highlands	☐
	L5	Livestock landless systems: Tropics	☐
	L6	Livestock landless systems: Subtropics	☒
	L7	Livestock landless systems: Temperate	☐
	L8	Livestock landless systems: Boreal and /or highlands	☐
Forest	F1	Naturally regenerated forests: Tropics	☐
	F2	Naturally regenerated forests: Subtropics	☒
	F3	Naturally regenerated forests: Temperate	☐
	F4	Naturally regenerated forests: Boreal and /or highlands	☐
	F5	Planted forests: Tropics	☐
	F6	Planted forests: Subtropics	☒
	F7	Planted forests: Temperate	☐
	F8	Planted forests: Boreal and /or highlands	☐
Aquaculture and Fisheries	A1	Self-recruiting capture fisheries: Tropics	☐
	A2	Self-recruiting capture fisheries: Subtropics	☒
	A3	Self-recruiting capture fisheries: Temperate	☐
	A4	Self-recruiting capture fisheries: Boreal and /or highlands	☐
	A5	Culture-based fisheries: Tropics	☐
	A6	Culture-based fisheries: Subtropics	☒
	A7	Culture-based fisheries: Temperate	☐
	A8	Culture-based fisheries: Boreal and /or highlands	☐
	A9	Fed aquaculture: Tropics	☐
	A10	Fed aquaculture: Subtropics	☒
	A11	Fed aquaculture: Temperate	☐
	A12	Fed aquaculture: Boreal and /or highlands	☐
	A13	Non-fed aquaculture: Tropics	☐
	A14	Non-fed aquaculture: Subtropics	☒
	A15	Non-fed aquaculture: Temperate	☐

	A16	Non-fed aquaculture: Boreal and /or highlands	☐
Crops	C1	Irrigated crops (rice) : Tropics	☐
	C2	Irrigated crops (rice) : Subtropics	☐
	C3	Irrigated crops (rice) : Temperate	☐
	C4	Irrigated crops (rice) : Boreal and /or highlands	☐
	C5	Irrigated crops (other) : Tropics	☐
	C6	Irrigated crops (other) : Subtropics	☒
	C7	Irrigated crops (other) : Temperate	☐
	C8	Irrigated crops (other) : Boreal and /or highlands	☐
	C9	Rainfed crops : Tropics	☐
	C10	Rainfed crops : Subtropics	☒
	C11	Rainfed crops : Temperate	☐
	C12	Rainfed crops : Boreal and /or highlands	☐
Mixed	M1	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	☐
	M2	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics	☐
	M3	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Temperate	☐
	M4	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Boreal and /or highlands	☐
Others [please specify]	O1		☐
Others [please specify]	O2		☐
Others [please specify]	O3		☐
Others [please specify]	O4		☐
Others [please specify]	O5		☐

5. Provide in Table 2 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;
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 the reliance of synthetic inputs, modern varieties, fossil fuels, etc.

Table 2. Description or characterization of production systems within the country

Production system	**Description**

Livestock grassland-based systems: Subtropics	Cattle reared through ranching and is based on natural or/and planted pasture and forage. It also includes free range under communal natural grazing areas. Within this system, there is a subsystem referred to as transhumance which involves shifting between upland and lowland plains. This entails grazing animals on the upland during the rainy season and the flood plains as the water recedes during the dry season.
Livestock landless systems: Subtropics	Livestock reared under housing facilities and fed on externally sourced feed. This system is also referred to as zero grazing. In Zambia, this mainly includes piggery and poultry and to a limited extent dairy cattle.
Naturally regenerated forests: Subtropics	Any land with a tree canopy cover of more than ten percent and area of more than zero point five hectares and includes young stands that have not yet reached, but are expected to reach, a crown density of ten percent and tree height of five metres that are temporarily under stocked areas which naturally grows or regenerates in a particular area. The regeneration process is commonly preceded by burning.
Planted forests: Subtropics	A forest stand of introduced or indigenous species established by planting or seeding in the process of afforestation or reforestation.
Self-recruiting capture fisheries: Subtropics	This involves natural processes for fisheries productivity in rivers, lakes and swamps. This constitutes most of the fisheries resources in Zambia.
Culture-based fisheries: Subtropics	This is land based aquaculture, which involves making of fish ponds, provision of external feeds, and controlled harvesting. Commonly farmed species include the three spotted tilapia (Oreochromis andersonii), the long-fin tilapia (Oreochromis macrochir) and the red breasted tilapia (Tilapia rendalli).
Fed aquaculture: Subtropics	This is a system based on establishment of pens and cages within natural water bodies for the cultivation, propagation or farming of fish, whether from eggs, spawn, spat or seed or by rearing fish lawfully taken from the wild or lawfully imported into the country. Commonly farmed species include the three spotted tilapia (Oreochromis andersonii), the long-fin tilapia (Oreochromis macrochir) , Nile Tilapia (Oreochromis niloticus), Tanganyika bream (Oreochromis tanganicae) and the red breasted tilapia (Tilapia rendalli).
Non-fed aquaculture: Subtropics	Involves stocking and rearing of fish in communal and private dams, without provision of external feeds.
Irrigated crops (other) : Subtropics	Irrigated crops other than rice refer to cropping systems where water is purposely provided. Irrigation could be overhead using sprinklers, furrow using natural gradient and controlled flooding. Common management practices such as inorganic and organic fertilizer application, weed control, including use of herbicides, pest and disease control through cultural methods and use of pesticides.
Rainfed crops : Subtropics	A cropping system relying exclusively on rainfall for source of moisture. This is typically in upland farming areas and constitutes the larger percentage of cropping in Zambia. Common management practices such as inorganic and organic fertilizer application, weed control, including use of herbicides, pest and disease control through cultural methods and use of pesticides.

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

Add

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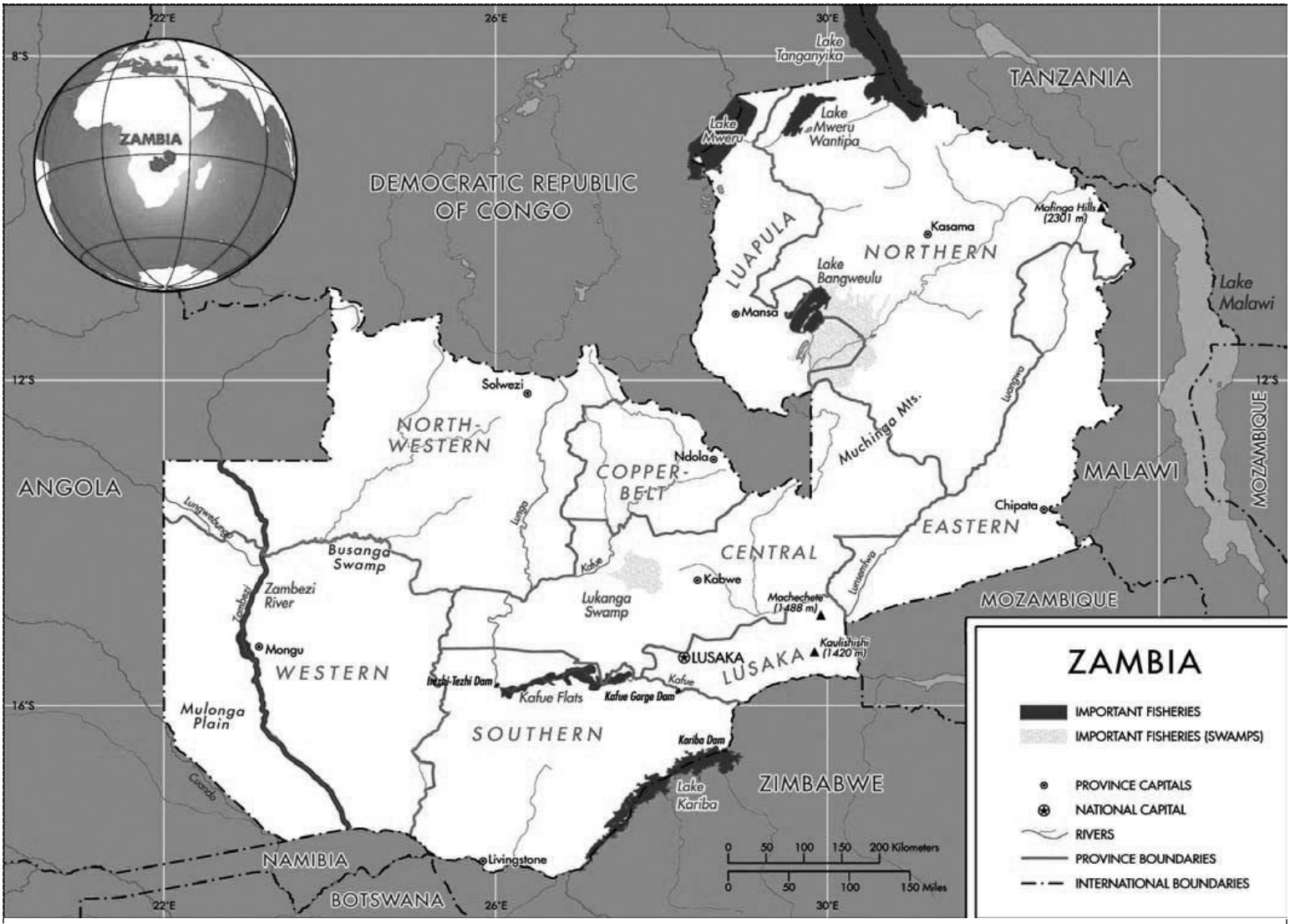

Click to upload map

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 of production systems in the country.

Production systems	Area	Production - quantity	Contribution to the agricultural sector economy	Reference year

	Value	Unit (enter)	Value	Unit (enter)	%	year
Livestock grassland-based systems: Subtropics	N/A	N/A	3,500,000	Herds	10	2013
Livestock landless systems: Subtropics	N/A	N/A	711,707 pigs; 75, 938,123 poultry	Number	-	2010
Naturally regenerated forests: Subtropics	-	-	0.2 million	m3	4.7	2010
Planted forests: Subtropics	55,000	Ha	1 million	m3	-	2010
Self-recruiting capture fisheries: Subtropics	>29,797	Km2	80, 826	MT	1.62	2014
Culture-based fisheries: Subtropics	4.38	Km2	2, 954	MT	0.18	2014
Fed aquaculture: Subtropics	83,123	m3	3, 806.8	MT	0.22	2014
Non-fed aquaculture: Subtropics	2.16	km2	9, 840	MT	0.57	2014
Irrigated crops (other) : Subtropics	100,000	Ha	273, 584	MT	-	2013
Rainfed crops : Subtropics	1, 1145,156	Ha	2, 900, 044	MT	6.5	2013

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.

In the rainfed crop production system, the main components of biodiversity for food and agriculture locally produced destined for exportation are tobacco, flowers and cotton. However, crops such as maize, soybeans and groundnuts are also grown for food and industrial use and in the manufacture of livestock feed in case of maize and soybean both local and regional market outlets. Livestock mainly cattle, goats, pigs and chickens are produced for local market and consumption. For fisheries, it is mainly kapenta and cat fish that are exported. Growing demand for chinsense (Poecilothrissa mweruensis) in Democratic Republic of Congo leads to overfishing which lead to depletion of the species in the self recruiting fisheries production system. While cotton is mainly grown by small holder farmers, tobacco and flower are produced largely by commercial farmers. The flue cured tobacco that is grown as an export crop demands a lot of fuel wood for the curing of the tobacco and therefore this has implication for national forestry biodiversity. There is need for a deliberate programme to encourage tree planting in order to overcome this threat behind desertification. The production of cotton requires use of insecticides which may have adverse effect on pollinators such as bees and other insects.

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 Table 1 as present in your country.

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 affecting the extent and distribution of associated biodiversity 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.

There are a number of drivers of change for specific components of biodiversity, which affect the extent and distribution of associated biodiversity. The effects of these drivers on associated biodiversity, ecosystems and wild foods have adversely impacted on ecosystem services and wellbeing of humans. Climate change, change in land and water use and management and advancements and innovations in science and technology have been identified drivers common to the various components of associated biodiversity.

The most important drivers are pests, diseases, alien invasive species, population growth and urbanization and policies for grassland livestock based production system. In case of invasive species population growth and urbanization, the common indicator is the area colonized by invasive species thereby reducing the biological diversity of the plant genetic resources. In the case of pest and diseases, the indicator is the number of livestock dying resulting in the loss of species.

With respect to the naturally regenerated forest, over-harvesting and over harvesting leads to depletion of the timber products and will in turn affect the non wood forest products such as caterpillars and edible orchids. The indicators arising from the impact of this drivers are the quantities harvested and tree species diversity (Forest Assessment Reports).

As for Self recruiting capture fisheries, over-exploitation and over harvesting is the key driver which impact on the diversity of fish species. The indicators are occurrence of species and catches. The main effect is that some fish species get depleted and threatened to extinction. The fish catches are reduced as a result of over exploitation. Pollution often has lagged effects on species diversity. However, effluent from the mines on the Copperbelt and Northwestern provinces of Zambia discharged into the main river systems such as the Kafue river system has been reported to negatively affect the diversity of butterflies,

dragonflies and other benthonic invertebrates as a result of elevated levels of redox, electrical conductivity and turbidity (Chama and Siachoono, 2015). Aquaculture practices affects fish biodiversity among others mainly through the escape of farmed fish into the natural water bodies negatively impacting on the natural diversity of fish resources in the country. The Oreochromis niloticus that was at one time farmed in Mazabuka area, has for instance escaped into the Kafue River and has since spread to all parts of the Kafue Flats. Crayfish (Cherax quadricarinatus) is another serious invasive species found in the Kafue flats and Lake Kariba. The exotic Nile tilapia (Oreochromis niloticus) escaped from aquaculture into the Kafue River in the 1980s (Schwanck, 1995) and in 2008 this species was distributed throughout the Kafue River between Itezhi-tezhi and Kafue Gorge dams and is now as common as the native O. andersonii (Deines et al., 2012).There may not only be competition between this species and the indigenous species of the area but also there is likelihood of hybridization taking place between the introduced species and the indigenous Oreochromis niloticus. This has in turn altered the genetic composition of the cichlid species of the Kafue Flats and the catchment areas. For fed aquaculture, the driver pollution and external inputs has negatively impacted on the fish species resulting in the reduced fish species. The indicators in this system are occurrence and catches.

In the case of rainfed crops production systems, the most important drivers could be identified as changes in land and water use and management, climate change, pests, diseases, alien invasive species as well as advancements and innovations in science and technology. The associated biodiversity that is affected is the diversity of plant genetic resources, including crop wild relatives where they occur, vertebrates such as insects which play a role in the pollinators, or vectors of diseases such as viruses. The main indicator is the occurrence of wild crop species, useful insect pests such as pollinators, changes in number of crop varieties expressed as crop diversity index. This information can be derived from annual national crop focus surveys.

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.

As provided in paragraph 9 above, climate change is the major driver affecting livestock grassland-based system, self recruiting capture fisheries and rainfed crops. The common nature of climate change that has been observed in Zambia is drought, floods and extreme temperature. According to recent studies, climate change influenced trends have been observed and the trends include; changes in the start and cessation of the rainy seasons, increased or decreased average precipitation and increasing average and maximum temperatures (NAPA 2007; Ngoma 2010). A number of reports have indicated increased variation in annual rainfall in the southern part of the country with 30 % probability that in any given year rainfall is 20% above or below the mean, resulting in either droughts or floods. Over the last 10 years, there has been two occurrences of floods which caused irreversible damage to crops in two thirds of the country. These extreme weather events have had negative effects on biodiversity for food and agriculture in the number of production systems. Climate change has reduced amount of suitable arable land for food crop production.

In the livestock grassland-based system for instance, the severity of climate change has affected the livestock genetic resources especially in the Central and southern regions of the country. One of the severe drought occurred during then 2004/05 season affecting two third of the country. This has led to reduce yields and livestock herds of cattle because of inadequate grazing areas and water. During the past 10 years, reduced precipitation has not only impacted crop production, but will also lead to poor range lands for livestock grazing. The prevalence of livestock diseases mainly Theileriosis, African swine fever, Babesiosis, Anaplasmosis), Trypanosomiasis, Contagious Bovine Pleuro Pneumonia (CBPP), Foot and Mouth Disease (FMD), and New Castle Disease (ND) and nutrition inadequacies are constraints that will directly or indirectly be magnified by climate change. With continued and anticipated climate extreme events, anticipated expansion of vector-borne and other livestock diseases, range lands will be reduced resulting in reduced income and nutrition quality of the poor rural communities.

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**	**Effect of drivers on sector biodiversity for food and agriculture** (2, 1, 0,-1, -2, NK, NA)			
	(Place pointer on the driver name for a detailed description)	PGR	FGR	AnGR	AqGR
Livestock grassland-based systems: Subtropics	Changes in land and water use and management	-1	NA	-1	NA
	Pollution and external inputs	NK	NA	NK	NA
	Over-exploitation and overharvesting	-1	NA	-1	NA
	Climate change	-1	NA	-1	NA
	Natural disasters	-1	NA	-1	NA
	Pests, diseases, alien invasive species	-1	NA	-1	NA
	Markets, trade and the private sector	NK	NA	NK	NA
	Policies	NA	NA	1	NA
	Population growth and urbanization	-1	NA	NK	NA
	Changing economic, socio-political, and cultural factors	NA	NA	NK	NA
	Advancements and innovations in science and technology	NK	NA	-1	NA
	Other [*please specify*]:				
Livestock landless systems: Subtropics	Changes in land and water use and management	-1	NA	-1	NA
	Pollution and external inputs	NK	NA	NK	NA
	Over-exploitation and overharvesting	NA	NA	NA	NA
	Climate change	-1	NA	-1	NA
	Natural disasters	NK	NA	NK	NA
	Pests, diseases, alien invasive species	NA	NA	-1	NA
	Markets, trade and the private sector	NA	NA	-1	NA
	Policies	NA	NA	NK	NA
	Population growth and urbanization	NK	NA	NK	NA

	Changing economic, socio-political, and cultural factors	NK	NA	NK	NA
	Advancements and innovations in science and technology	NK	NA	NK	NA
	Other [*please specify*]:				
Naturally regenerated forests: Subtropics	Changes in land and water use and management	-1	-2	NK	NA
	Pollution and external inputs	-1	-2	-1	NK
	Over-exploitation and overharvesting	-1	-1	-1	NK
	Climate change	-1	-1	-1	-1
	Natural disasters	-1	-1	-1	-1
	Pests, diseases, alien invasive species	-1	-1	NK	NK
	Markets, trade and the private sector	NK	NA	NA	NA
	Policies	NK	-1	NA	NK
	Population growth and urbanization	-1	-1	NK	NA
	Changing economic, socio-political, and cultural factors	-1	-1	NK	NA
	Advancements and innovations in science and technology	NK	-1	NK	NK
	Other [*please specify*]:				
Planted forests: Subtropics	Changes in land and water use and management	-1	-2	NK	NA
	Pollution and external inputs	-1	-2	-1	NK
	Over-exploitation and overharvesting	-1	-1	-1	NK
	Climate change	-1	-1	-1	-1
	Natural disasters	-1	-1	-1	-1
	Pests, diseases, alien invasive species	-1	-1	NK	NK
	Markets, trade and the private sector	NK	NA	NA	NA
	Policies	NK	-1	NA	NK
	Population growth and urbanization	-1	-1	NK	NA
	Changing economic, socio-political, and cultural factors	-1	-1	NK	NA
	Advancements and innovations in science and technology	NK	-1	NK	NK
	Other [*please specify*]:				
Self-recruiting capture fisheries: Subtropics	Changes in land and water use and management	NK	NA	NA	-1
	Pollution and external inputs	1	NA	NK	-1
	Over-exploitation and overharvesting	NK	NA	0	-1
	Climate change	NK	NA	0	-1
	Natural disasters	-1	NK	-1	-1

	Pests, diseases, alien invasive species	NK	NA	NK	-1
	Markets, trade and the private sector	NA	NA	NA	-1
	Policies	NK	NA	NA	1
	Population growth and urbanization	-1	NA	NK	-1
	Changing economic, socio-political, and cultural factors	NA	NA	NA	-1
	Advancements and innovations in science and technology	NK	NA	NA	1
	Other [*please specify*]:				
Culture-based fisheries: Subtropics	Changes in land and water use and management	-1	-1	NK	NK
	Pollution and external inputs	1	NA	NK	1
	Over-exploitation and overharvesting	NA	NA	NA	-1
	Climate change	NA	NA	NA	-1
	Natural disasters	NA	NA	NA	-1
	Pests, diseases, alien invasive species	NA	NA	NA	NK
	Markets, trade and the private sector	NA	NA	NA	1
	Policies	NA	NA	NA	1
	Population growth and urbanization	NA	NA	NA	1
	Changing economic, socio-political, and cultural factors	NA	NA	NA	1
	Advancements and innovations in science and technology	NA	NA	NA	1
	Other [*please specify*]:				
Fed aquaculture: Subtropics	Changes in land and water use and management	NK	NA	NA	-1
	Pollution and external inputs	1	NA	NK	1
	Over-exploitation and overharvesting	NA	NA	NA	-1
	Climate change	NA	NA	NA	-1
	Natural disasters	NA	NA	NA	0
	Pests, diseases, alien invasive species	NA	NA	NA	-1
	Markets, trade and the private sector	NA	NA	NA	1
	Policies	NA	NA	NA	1
	Population growth and urbanization	NA	NA	NA	1
	Changing economic, socio-political, and cultural factors	NA	NA	NA	1
	Advancements and innovations in science and technology	NA	NA	NA	1
	Other [*please specify*]:				
Non-fed aquaculture: Subtropics	Changes in land and water use and management	NK	NA	NA	-1

	Pollution and external inputs	1	NA	NA	-1
	Over-exploitation and overharvesting	NA	NA	NA	-1
	Climate change	NA	NA	NA	-1
	Natural disasters	NA	NA	NA	-1
	Pests, diseases, alien invasive species	NA	NA	NA	-1
	Markets, trade and the private sector	NA	NA	NA	1
	Policies	NA	NA	NA	1
	Population growth and urbanization	NA	NA	NA	-1
	Changing economic, socio-political, and cultural factors	NA	NA	NA	-1
	Advancements and innovations in science and technology	NA	NA	NA	1
	Other [*please specify*]:				
Irrigated crops (other) : Subtropics	Changes in land and water use and management	-1	NK	-1	NA
	Pollution and external inputs	-1	NA	-1	-1
	Over-exploitation and overharvesting	-1	NK	-1	NA
	Climate change	-1	NA	-1	-1
	Natural disasters	-1	NK	-1	NA
	Pests, diseases, alien invasive species	-1	NA	-1	NK
	Markets, trade and the private sector	-1	NA	NA	NA
	Policies	1	-1	NK	NA
	Population growth and urbanization	-1	-1	-1	NA
	Changing economic, socio-political, and cultural factors	-1	-1	NA	NA
	Advancements and innovations in science and technology	-1	1	NK	NA
	Other [*please specify*]:				
Rainfed crops : Subtropics	Changes in land and water use and management	-1	-1	-1	-1
	Pollution and external inputs	-1	NA	NK	NA
	Over-exploitation and overharvesting	NA	NA	NA	NA
	Climate change	-1	NA	-1	NA
	Natural disasters	-1	NA	-1	NA
	Pests, diseases, alien invasive species	-1	NA	-1	NA
	Markets, trade and the private sector	1	NA	NA	NA
	Policies	1	NA	NK	NA
	Population growth and urbanization	NK	-1	-1	NA
	Changing economic, socio-political, and cultural factors	NK	-1	-1	NA

	Advancements and innovations in science and technology	-1	NA	NK	NA
	Other [*please specify*]:				

Effects of drivers of change on associated biodiversity

12. What have been the main drivers affecting regulating and supporting ecosystem services in the country during the last 10 years? Describe, for each production system, 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). Place pointer on the ecosystem service name for a detailed description.

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

Production systems	**Drivers**	**Effect of drivers on ecosystem services** (2, 1, 0,-1, -2, NK, NA) (Place pointer on the ecosystem service name for a detailed description)								
	(Place pointer on the driver name for a detailed description)	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 grassland-based systems: Subtropics	Changes in land and water use and management	NK	-1	NK	NA	1	1	1	-1	-1
	Pollution and external inputs	0	1	-1	-1	1	-2	0	-1	NK
	Over-exploitation and overharvesting	NA	NK	NA	NK	-1	-2	-1	-1	-1
	Climate change	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Natural disasters	-2	-1	-1	-1	-1	-2	-1	-1	-1
	Pests, diseases, alien invasive species	-1	-1	NA	NA	NA	NA	NA	-1	NK
	Markets, trade and the private sector	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Policies	0	0	0	NA	NA	NA	NA	NA	NA
	Population growth and urbanization	-1	-1	-1	-1	NK	-1	-1	-1	-1
	Changing economic, socio-political, and cultural factors	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Advancements and innovations in science and technology	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Other [*please specify*]:									
Livestock landless systems: Subtropics	Changes in land and water use and management	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Pollution and external inputs	NA	NA	NA	NA	NA	NA	NA	NA	NA

	Over-exploitation and overharvesting	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Climate change	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Natural disasters	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Pests, diseases, alien invasive species	-1	-1	NA	NA	NA	NA	NA	-1	-1
	Markets, trade and the private sector	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Policies	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Population growth and urbanization	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changing economic, socio-political, and cultural factors	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Advancements and innovations in science and technology	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Other [*please specify*]:									
Naturally regenerated forests: Subtropics	Changes in land and water use and management	-1	NK	-1	-1	-1	-1	-1	-1	-1
	Pollution and external inputs	-1	-1	-1	NA	-1	NK	-1	-1	NK
	Over-exploitation and overharvesting	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Climate change	-1	-1	-1	-1	-1	-1	-1	-1	NK
	Natural disasters	-1	-1	-1	-1	-1	-1	-1	-1	NA
	Pests, diseases, alien invasive species	-1	-1	NK	NA	NA	NA	NA	-1	NK
	Markets, trade and the private sector	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Policies	1	NK	NK	1	1	1	-1	1	NK
	Population growth and urbanization	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Changing economic, socio-political, and cultural factors	-1	NA	-1	NA	-1	NK	NK	NK	NK
	Advancements and innovations in science and technology	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Other [*please specify*]:									
Planted forests: Subtropics	Changes in land and water use and management	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Pollution and external inputs	-1	-1	-1	NK	NA	-1	-1	-1	NK
	Over-exploitation and overharvesting	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Climate change	-1	-1	-1	-1	-1	-1	-1	-1	-1
	Natural disasters	-1	-1	-1	-1	-1	-1	NK	-1	NK
	Pests, diseases, alien invasive species	-1	-1	-1	-1	-1	-1	NA	NA	NA
	Markets, trade and the private sector	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Policies	1	NK	NK	NK	NK	NK	NK	NK	NK
	Population growth and urbanization	-1	NA	-1	-1	-1	-1	-1	-1	-1
	Changing economic, socio-political, and cultural factors	NA	NA	NA	NA	NA	NA	NA	NA	NA

	Advancements and innovations in science and technology	1	NK	NA	NA	NA	NA	NA	NA	NA
	Other [*please specify*]:									
Self-recruiting capture fisheries: Subtropics	Changes in land and water use and management	NA	-1	-1	-1	-1	NA	NK	NK	-1
	Pollution and external inputs	NA	-1	-1	-1	-1	NA	NK	NK	-1
	Over-exploitation and overharvesting	NA	NK	NA	NK	NA	NA	NK	NK	NA
	Climate change	NA	NK	-1	-1	-1	NA	NK	NK	-1
	Natural disasters	NA	-1	0	-1	-1	NA	-1	-1	-1
	Pests, diseases, alien invasive species	NA	-1	-1	-1	NK	NA	NK	1	1
	Markets, trade and the private sector	NA	NK	NA	-1	-1	NA	NA	NA	NK
	Policies	NA	NA	NA	NK	NK	NA	NK	NK	NK
	Population growth and urbanization	NA	NK	NK	NK	NK	NA	NK	NK	NK
	Changing economic, socio-political, and cultural factors	NA	NK	NK	-1	-1	NA	NK	NK	-1
	Advancements and innovations in science and technology	NA	1	NK	NK	NK	NA	NK	NK	-1
	Other [*please specify*]:									
Culture-based fisheries: Subtropics	Changes in land and water use and management	NA	-1	NK	-1	-1	NA	0	1	1
	Pollution and external inputs	NA	-1	NA	NK	NK	NA	NK	-1	-1
	Over-exploitation and overharvesting	NA	NK	NK	-1	NK	NA	NK	1	1
	Climate change	NA	-1	-1	-1	-1	NK	NK	-1	-1
	Natural disasters	NA	NK	NK	NK	NK	NA	NK	-1	-1
	Pests, diseases, alien invasive species	NA	NK	NK	-1	-1	NK	NK	-1	-1
	Markets, trade and the private sector	NA	NA	NA	NK	NK	NA	NA	NK	NK
	Policies	NA	NK	NK	NK	NA	NA	NA	NK	NK
	Population growth and urbanization	NA	NA	NK	NK	NK	NK	NK	NK	NK
	Changing economic, socio-political, and cultural factors	NA	NA	NK	NK	NK	NK	NK	NK	NK
	Advancements and innovations in science and technology	NA	1	NK	NK	1	NK	NK	NK	NK
	Other [*please specify*]:									
Fed aquaculture: Subtropics	Changes in land and water use and management	NA	-1	NK	NK	NK	NA	NK	-1	-1
	Pollution and external inputs	NA	-1	NK	NK	NK	NA	NK	NK	1
	Over-exploitation and overharvesting	NA	NK	NK	NK	NK	NA	NK	NK	1
	Climate change	NA	-1	NK	NK	-1	NA	NK	-1	-1
	Natural disasters	NA	-1	NK	NK	NK	NA	NK	-1	-1
	Pests, diseases, alien invasive species	NA	-1	NK	-1	-1	NA	NK	NK	NK

	Markets, trade and the private sector	NA	NK	NK	NK	NK	NA	NK	NK	NK
	Policies	NA	-1	NK	-1	-1	NA	NK	NK	-1
	Population growth and urbanization	NA	NK	NK	NK	1	NA	NK	NK	NK
	Changing economic, socio-political, and cultural factors	NA	NK	NK	NK	NK	NA	NK	NK	NK
	Advancements and innovations in science and technology	NA	-1	NK	NK	NK	NA	NK	NK	NK
	Other [*please specify*]:									
Non-fed aquaculture: Subtropics	Changes in land and water use and management	NA	-1	-1	-1	-1	NA	NK	NK	-1
	Pollution and external inputs	NA	-1	NK	-1	-1	NA	NK	NK	-1
	Over-exploitation and overharvesting	NA	NK	NK	NK	NK	NA	NK	NK	NK
	Climate change	NA	-1	NK	NK	-1	NA	NK	-1	-1
	Natural disasters	NA	NK	NK	-1	-1	NA	NK	-1	-1
	Pests, diseases, alien invasive species	NA	-1	NK	-1	-1	NA	NK	-1	-1
	Markets, trade and the private sector	NA	NK	NK	-1	-1	NA	NK	1	1
	Policies	NA	NK	NK	NK	NK	NA	NK	NK	NK
	Population growth and urbanization	NA	NA	NK	NK	NK	NA	NK	NK	NK
	Changing economic, socio-political, and cultural factors	NA	NK	NK	-1	-1	NA	NK	NK	-1
	Advancements and innovations in science and technology	NA	1	NK	NK	NK	NA	NK	NK	-1
	Other [*please specify*]:									
Irrigated crops (other) : Subtropics	Changes in land and water use and management	NK	-1	NK	1	1	-1	1	-1	NK
	Pollution and external inputs	-1	-1	-1	NK	1	-1	NK	-1	NK
	Over-exploitation and overharvesting	NA	NA	NK	NK	-1	-1	-1	NA	NK
	Climate change	NK	NK	NK	NA	NK	NK	-1	NK	NK
	Natural disasters	NA	NA	NK	NK	NK	-1	-1	NK	NK
	Pests, diseases, alien invasive species	NK	NK	NK	NK	NK	NA	NA	NA	NK
	Markets, trade and the private sector	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Policies	NK	NK	NA	NK	NA	NA	NA	NA	NA
	Population growth and urbanization	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changing economic, socio-political, and cultural factors	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Advancements and innovations in science and technology	NK	1	NK	1	1	1	1	NK	NK
	Other [*please specify*]:									
Rainfed crops : Subtropics	Changes in land and water use and management	NK	NK	-1	-1	-1	-2	-1	-1	NK
	Pollution and external inputs	NK	NK	-1	NA	NK	-1	NA	-1	NK

	Over-exploitation and overharvesting	NK	NK	NK	-1	-1	-2	NK	-1	NK
	Climate change	NK	-1	NK	-1	NK	NK	-1	NK	NK
	Natural disasters	NK	NK	-1	-1	-1	-2	-1	-1	NK
	Pests, diseases, alien invasive species	NA	NK	NA	NA	NA	NA	NA	NK	NK
	Markets, trade and the private sector	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Policies	NK	NK	NA	NK	1	1	NK	NA	NK
	Population growth and urbanization	NA	NA	NA	-1	NK	-1	NK	NK	NK
	Changing economic, socio-political, and cultural factors	NA	NA	NA	-1	-1	-1	NA	NK	NK
	Advancements and innovations in science and technology	NK	1	NA	NK	2	2	1	NK	NK
	Other [*please specify*]:									

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.

In self recruiting capture fisheries, during the climate change, and in particular the drought and floods, the habitat provisioning are disturbed thereby losing the breeding ground for fish. This has a tendency of disturbing the breeding periods of the fish.

For naturally regenerated forests, the specific drivers affecting ecosystem services are changes in land and water use and management will include clearing forests to open up for agriculture and/ or mining which exposes the soils leading to erosion which impacts on soil formation and protection. Removal of the trees for human use results in increased evaporation and specifically impact on the ecosystem services that provide for water recycling and habitat provisioning. The change in land use has also led to land degradation.

In the rainfed crops production system, the driver climate change will affect pest disease regulation ecosystem service as well as water cycling because increased temperature and reduced rainfall have disturbed the regulatory system for pest and diseases and created the environment for emergence of new pest and diseases, reduced the resilience of the crops to withstand. The changes in land and water use and management have affected the soil formation and protection ecosystem, nutrient cycling and water cycling. This has been evident with respect to convention agriculture as opposed to conservation agriculture. The alien invasive species have impacted negatively on natural habitat provisioning for pollination agents that are associated with specific plant species that have been replaced.

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.

Drivers	**Effect of drivers** (2, 1, 0,-1, -2, NK, NA)		
(Place pointer on the driver name for a detailed description)	Availability of wild foods	Knowledge of wild foods	Diversity of wild food
Changes in land and water use and management	-1	-1	-1
Pollution and external inputs	-1	-1	-1

Drivers	Effect of drivers (2, 1, 0,-1, -2, NK, NA)		
Over-exploitation and overharvesting	-2	-1	-2
Climate change	-2	-1	-1
Natural disasters	-1	-1	-1
Pests, diseases, alien invasive species	-2	-1	-1
Markets, trade and the private sector	-1	-1	-1
Policies	1	1	2
Population growth and urbanization	-2	-1	-2
Changing economic, socio-political, and cultural factors	-1	NK	-1
Advancements and innovations in science and technology	NK	NK	NK
Other [*please specify*]:			

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

All the indicated drivers except the advancements and innovations in science and technology and specific national policy intervention affect the availability, diversity and knowledge associated with maintenance and use of wild foods in the country.

Change in land and water use management has been observed to cause alteration to the natural ecosystem and consequently negatively affect the availability, knowledge and diversity of wild food taxa. This includes for example in the naturally regenerated forests, the clearing of wild fruits such as Uapaca kirkiana. Over exploitation and unsustainable harvesting of wild foods such fisheries in Mweru-Luapula system has led to the loss of a fish species, Labeo altibelios, and edible orchids (Disa spp, Hebanarium spp) have been subject to over harvesting a practice that has reduced their availability. However, policy direction that puts deliberate intervention measures for the conservation and sustainable use of wild food plant species, on the other hand, usually lead to strongly positive increase in the wild food plant species.

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?

A number of drivers have significant effect on the involvement of women in the maintenance and use of biodiversity for food and agriculture. Women are largely involved in agricultural activities, harvesting of wild food species for household food consumption and sale to generate income.

The specific drivers here include: changes in land and water use and management, pollution and external inputs where women has limited capacity to afford the use of external chemical fertilizers. The conversion of land for agriculture is mainly due to the farmers' practice of shifting cultivation which is very common among small farmers especially in the Northern region of the country where the soils are acidic in nature and therefore could hardily support the growth of most agricultural crops. In some ways, this impact negatively on the biodiversity of wild foods and other useful wild biodiversity necessary for performance of the ecosystem functions. Related to this is the direct over-exploitation and over harvesting of wild food species. As an example, Some edible orchid species of genera such as Disa spp., Satyrium spp. and Habenaria spp. have been over harvested in the wild for commercial purposes to an extent where these important components of ecosystem services for certain pollination agents have completely disappeared from their natural habitat.

The driver related to changing economic, socio-political, and cultural factors compels women to get involved in the maintenance and use of biodiversity for food and agriculture for the provision of food for the households. The increased poverty levels

experienced by rural communities over the past 10 years has led to increased involvement of women in crop production activities and gathering of wild foods such as caterpillars to obtain food for their families.

17. Which drivers have had the most significant effect on the maintenance and use of traditional knowledge relating to biodiversity for food and agriculture?

The drivers that have had the significant effect on the maintenance and use of traditional knowledge relating to biodiversity for food and agriculture include those that have had significant negative sense include advancements and innovations in science and technology, Markets, trade and the private sector, Population growth and urbanization and Changing economic, socio-political, and cultural factors. Science and technology are relatively newer practices which substitute traditional knowledge e.g. replacement of low varieties by improved crop varieties. The market, trade and the private sector negate the cultural values of the traditional knowledge systems. The drivers that positively affect on the maintenance and use of traditional knowledge include climate change and changes in land and water use and management and policies related to conservation and sustainable use of natural resources and involvement participation of local communities.

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 drivers that have had the most significant effect on the role of biodiversity for food and agriculture include policies related to conservation and sustainable use of natural resources and involvement participation of local communities. The other drivers are changes in land and water use and management and advancements and innovations in science and technology both of which contribute to improved productivity such as improved seed varieties that are superior in performance than traditional varieties.

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.

Countermeasures planned or in place to reduce adverse consequents of drivers
(a) Associated biodiversity

Enforcement of fish ban in natural water bodies during peak breeding period, sensitization and training of fishers on the use of sustainable fishing practices, promotion of fisheries co-management initiative involving government and stakeholders, promoting fish farming.

Promotion of user friendly energy sources as opposed to use of wood fuel, promotion of community based forest resource management, encouragement of procurement and policing on licenses

Annual tree planting programme, replanting of tree plantations in all the 10 provinces in the past 10 years, promotion of private tree plantation, indigenous tree planting.

Collection and conservation of local crop varieties, promoting crop diversification, promoting conservation agriculture practices and integrated soil fertility management aimed at reducing use of mineral fertilizers, promoting climate smart agricultural practices such as growing of more drought tolerant crop varieties.

(b) ecosystem services
Promoting agroforestry practices which entails integrating forest species under rainfed agriculture, generation of bio-energy from the waste, promoting waste recycling where some paper and practices are being recycled, promoting use of compost manure to enhance soil formation and protection ecosystems services

(c) Wild foods
Micropropagation of threatened wild food plant species, domestication of popular wild food species, educating and sensitization of local communities to encourage communities to use sustainable harvesting practices

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.

I*MPORTANT: Throughout these guidelines, questions on production systems will refer to the production systems identified in Table 1 as present in your country.*

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.

(a) Common characteristics
The state of diversity of forest, aquatic (fisheries), crops is considered to be relatively rich in terms of inter and intra species diversity. The total diversity of domesticated livestock is estimated at 16 species. These consist of 10 species of mammals and 6 species of birds. Domesticated mammals are dominated by cattle while birds are dominated by chickens. Other mammals are goats, sheep, pigs. Zambia's forests are also important repositories of biodiversity and provide a wide range of goods for

livelihoods (especially for the rural poor) such as timber and non-timber forest products including, fibre, medicinal plants, edible wild vegetables, edible wild fruits, edible insects, mushrooms, honey, etc. The country is endowed with more than 40% of the fresh water in the southern African region and gives it high potential in terms of both inland capture fisheries and aquaculture. The country has four (4) natural lakes (Bangweulu, Mweru-Luapula, Tanganyika and Mweru-Wantipa), three (3) man-made lakes (Kariba, Itezhi-tezhi and Lusiwashi), three (3) rivers/ floodplains (Zambezi, Kafue and Chambeshi) as well as one (1) swamp (Lukanga – Ramsar site) which houses a high diversity of fish species and other aquatic organisms. There are at least 106 cultivated plant species in Zambia and of these 52% are exotic species, 33% are naturalized and 15% are indigenous. There are also three species of wild rice that are related to the cultivated rice. In addition, there are 17 crop wild relatives in Zambia. A number of crops, which include maize as a primary staple, sweet potato and groundnuts are cultivated almost throughout the country. Other food crops cultivated in some parts of the country include sorghum, finger millet, rice, cassava and beans.

The common characteristics in the trend of all the components of diversity is that generally there decline in genetic diversity.

There has been an increase on demand for wood and non wood for which there has been low replacement rates. This demand for wood resources has resulted in deforestation whose rate is surpassing 250,000 to 300,000 Hectares/year (ILUA Final Report, 2008). The situation has been worsened by the increased demand for charcoal especially in the towns and cities which in recent months has been triggered by increased load shedding of hydro generated electricity. This situation is likely to lead to massive bare lands especially that the national afforestation rates are comparatively low.

According to the recent Catch Assessment Surveys for Itezhi-tezhi, Lusiwashi, Kariba, Upper Zambezi, Tanganyika, Mweru Wantipa, Mweru Luapula and Bangweulu fishery areas (DoF, 2015), the CUE for kapenta on Lake Kariba showed a decline from 177 to 72 kg/boat/night while effort had increased tremendously; commercial kapenta was no longer taking place on Lake Tanganyika with increased operational costs cited as the major reason; and overall, the total fish catches increased by slightly over 7% from 75,187 MT recorded in 2013 to 80,826 MT in 2014 mainly attributed to increase in fish catches on the Bangweulu, Mweru Luapula and Tanganyika fishery areas (DoF, 2015). The least contributors to the national catch over the same period were Lower Zambezi (476 MT), Lusiwashi (833 MT), and Chambeshi (945 MT) (DoF, 2015).

(b) Difference between the sectors
The major differences between the sectors is in the state of conservation. The conservation status of plant genetic resources is the most advanced as there is in place a deliberate national programme for the conservation of these resources. This includes the establishment of a gene bank facility that serves as a depository for seed samples of local crop germplasm collected from the country. The major conservation strategy is ex situ collections, although there are initiatives to establish in situ -on farm through participation of local communities.This includes useful wild plants and crop wild relatives. The country has this far collected and maintained ex situ a total of about 7,000 seed samples of plant genetic resources. The forestry genetic resources are conserved in situ through a number of designated forest reserves whose number stand at 487. Of these 45.4% is intact while 54.6% were encroached or depleted. There are limited conservation measure in place for conservation of livestock genetic resources compared to plant and forest genetic resources. Steps have been taken to characterize local livestock breeds as part of measures to strengthen the conservation of livestock genetic resources in the country. There is an ex situ conservation facility that maintains semen of local breeds of cattle. The conservation status of fisheries is such that all the natural water bodies have been officially designated management areas where only licensed fishers are permitted. Breeding areas have been identified but only one has been gazetted in Mweru-Luapula to date.

c) synergies or trade-offs in the state of diversity between sectors.
The encroachment of forest reserves which has the effect of eroding the genetic resources, the diversity crop genetic resources could be enhanced while negatively impacting on the forest genetic resources. While forest reserves are used for conservation of forest genetic resources, there are also crop wild relatives in those forest reserves which are components of plant genetic resources.

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 ecosystem regulating and supporting 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 systems	**Trends in last 10 years (2,1,0,-1,-2, NK, NA)** (Place pointer on the component of associated diversity name for a description)			
	Micro-organisms	Invertebrates	Vertebrates	Plants
Livestock grassland-based systems: Subtropics	-1	-1	NK	-1
Livestock landless systems: Subtropics	NA	NA	NA	NA
Naturally regenerated forests: Subtropics	-1	-1	-1	-1
Planted forests: Subtropics	NK	NK	-2	-1
Self-recruiting capture fisheries: Subtropics	-1	-1	NA	NK
Culture-based fisheries: Subtropics	NK	NK	NK	NK
Fed aquaculture: Subtropics	NK	NK	NK	NK
Non-fed aquaculture: Subtropics	NK	NK	NK	NK
Irrigated crops (other) : Subtropics	NK	NK	NK	NK
Rainfed crops : Subtropics	NK	NK	NK	NK

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.

In the livestock grassland-based system, there has been a decreasing trend of micro organisms and invertebrates associated with this production system. This situation has been precipitated by the decline in number of livestock herds as a result of outbreaks of diseases. In turn, this has resulted in reduced soil formation processes and occurrence of natural pollinators in the wild. The trend of all associated biodiversity within the naturally regenerated forests including micro organisms, invertebrates, vertebrates and associated plants has been on a decline. This situation is as a result of the increasing deforestation for timber and over harvesting or over exploitation of non timber products.

It has been observed over the recent past that while the contribution of cichlids to the national fish production is decreasing, other “non-traditional” or “previously not exploited” fish species like the Barbus sp, small Mormyrids and mud-suckers are increasing in number at fish markets. The marginal increase to the overall national annual fish production is coming from such fish species and aquaculture.

In years of serious drought, a number of snails/ snail shells and bi-valves have been observed on the shows of man-made lakes; some of these organisms have died and not been able to crawl back into the reservoirs. New shrubs and higher plants have emerged along the shorelines when drought persists and/ or the following rainy season does not yield more water to cover and reach the levels previously known as “water-marks”.

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)** (Place pointer on the ecosystem service name for a description)								
	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 grassland-based systems: Subtropics	NA	NK	-1	NK	1	1	1	1	NK
Livestock landless systems: Subtropics	NA	1	NA	NA	NA	NA	NA	NA	NA
Naturally regenerated forests: Subtropics	1	1	1	2	2	1	1	1	2
Planted forests: Subtropics	0	0	0	0	0	0	0	1	1
Self-recruiting capture fisheries: Subtropics	NA	1	NK	1	1	NA	NA	1	1
Culture-based fisheries: Subtropics	NA	1	NA	1	1	NA	NA	1	1
Fed aquaculture: Subtropics	NA	1	-1	1	1	-1	1	-1	1
Non-fed aquaculture: Subtropics	NA	1	-1	1	1	-1	1	-1	1
Irrigated crops (other) : Subtropics	1	-1	-1	1	1	-1	1	-1	1
Rainfed crops : Subtropics	2	0	1	-1	1	-1	NK	-1	2

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

In the livestock grassland-based system, due to overstocking and overgrazing in the communal grazing areas, there has been an increase in land degradation that resulted in reduced support of the the soil profile which in turn led to decreasing support of water purification and waste treatment regulating and supporting ecosystem services.

According to the recent Catch Assessment Surveys for Itezhi-tezhi, Lusiwashi, Kariba, Upper Zambezi, Tanganyika, Mweru Wantipa, Mweru Luapula and Bangweulu fishery areas (DoF, 2015), the CUE for kapenta on Lake Kariba showed a decline from 177 to 72 kg/boat/night while effort had increased tremendously; commercial kapenta was no longer taking place on Lake Tanganyika with increased operational costs cited as the major reason; and overall, the total fish catches increased by slightly over 7% from 75,187 MT recorded in 2013 to 80,826 MT in 2014 mainly attributed to increase in fish catches on the Bangweulu, Mweru Luapula and Tanganyika fishery areas (DoF, 2015). The least contributors to the national catch over the same period were Lower Zambezi (476 MT), Lusiwashi (833 MT), and Chambeshi (945 MT) (DoF, 2015).

About 82.5 % of the estimated 1,417,992 smallholder farmers own at least one type of livestock (cattle, goats, pigs, sheep and donkey) or poultry (chicken, guinea fowls, ducks/geese and rabbits). Livestock population in small holder subsector increased between 2001 and 2008 for cattle (88%), goats (105%), pigs (106%) and sheep (207%). However, there was a decline in the

livestock population between 2008 and 2012. The livestock estimates among smallholder subsector during this period according to the CSO/FSRP Supplemental Surveys (2001, 2004, 2008) and Rural Agricultural and Livelihood Surveys (2012)

With regard to forest genetic resources, in North-West Province, the forests are largely intact and where the potential for timber extraction is highest, the REDD+ priority should be to develop and enforce sustainable forestry, but also to ensure that the energy needs of the large numbers of people migrating into the area are met sustainably. REDD+, or REDD-plus, is an enhanced version of the mechanism for reducing emissions from deforestation and forest degradation in developing countries (REDD), which emerged in 2008, building in the ideas of conserving and sustainably managing forests, forest restoration and reforestation. In the more densely populated Central, Southern and Eastern Provinces, where forest cover has already been significantly reduced and degraded and the demand for charcoal is greatest, REDD+ activities must address the issue of charcoal demand (UNEP, 2015).

For the crop genetic resources, the total number of cultivated plants in Zambia, which is estimated to stand at 106 has not changed much since the last ten year (MLENR Report, 2015). There has generally been an increase in varietal diversity in a number of crops at farm level, especially among small scale farmers, through increased access to a range of improved crop varieties, especially for such crops as maize, sorghum, cassava, sweet potato, beans and groundnuts. According to CSO (2008), maize continues to be a dominant crop cultivated throughout the country which account for 60% of the cultivated area. The trend is that intra crop diversity of local crop varieties on farm has generally been on the decrease. For instance there has been an increase of households using improved crop varieties of maize. This could be attributed to the increase in public investment through FISP and developed seed industry in Zambia.

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.

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) (Place pointer on the ecosystem service name for a description)								
		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 grassland-based systems: Subtropics	Changes in animal genetic resources	NA	NK	NK	NK	NK	-1	NA	NK	NK
	Changes in crop genetic resources	NA	NK	NK	NK	NK	-1	NK	NK	NK
	Changes in forest genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in aquatic genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NK	1	NK	NK	NK	NK	NA	NA	NK

	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
Livestock landless systems: Subtropics	Changes in animal genetic resources	NA	NK	NA	NA	NK	NA	NA	NA	NK
	Changes in crop genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in forest genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in aquatic genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NA	NA	NA	NK	NA	NA	NA	NA
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NA	NA	NA	NA
	Changes in vertebrates genetic resources (associated biodiversity)	NA	NK	NK	NA	NA	NA	NA	NA	NK
	Changes in plants genetic resources (associated biodiversity)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naturally regenerated forests: Subtropics	Changes in animal genetic resources	NK	NA	NK	NK	NK	NK	NK	NK	NK
	Changes in crop genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in forest genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NK	NK	NA	NA
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NA	NK	NA	NK	NK	NA	NA	NA
	Changes in vertebrates genetic resources (associated biodiversity)	-1	NK	NK	NK	NK	NK	NA	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	-1	NK	NK	NK	-1	NK
Planted forests: Subtropics	Changes in animal genetic resources	NK	NA	NK	NK	NK	NK	NK	NK	NK
	Changes in crop genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in forest genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NK	NK	NA	NA
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NA	NK	NA	NK	NK	NA	NA	NA
	Changes in vertebrates genetic resources (associated biodiversity)	-1	NK	NK	NK	NK	NK	NA	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	-1	NK	NK	NK	-1	NK
Self-recruiting capture fisheries: Subtropics	Changes in animal genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in crop genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in forest genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in aquatic genetic resources	NA	NK	NA	NK	NK	NK	NK	NK	NK

	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NA	NA	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NA	NK	NK	NK
Culture-based fisheries: Subtropics	Changes in animal genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in crop genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in forest genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in aquatic genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NA	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NA	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NA	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NA	NK	NK	NK	NK	NA	NK	NK	NK
Fed aquaculture: Subtropics	Changes in animal genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in crop genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in forest genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in aquatic genetic resources	NA	NK	NK	NK	NK	NA	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NA	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NA	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Non-fed aquaculture: Subtropics	Changes in animal genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in crop genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in forest genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in aquatic genetic resources	NA	NK	NK	NK	NK	NA	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NA	NK	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NA	NK	NK	NA	NK	NA	NK	NK	NK
	Changes in plants genetic resources (associated biodiversity)	NA	NA	NA	NA	NA	NA	NA	NA	NA

Irrigated crops (other) : Subtropics	Changes in animal genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in crop genetic resources	NK	NK	NK	NK	NK	1	1	NK	NK
	Changes in forest genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in aquatic genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NA	1	NK	NK	NA	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NK	NK	NA	1	NK	NK	NA	NK
	Changes in vertebrates genetic resources (associated biodiversity)	1	-1	NK	NK	NA	NA	NA	NA	NK
	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
Rainfed crops : Subtropics	Changes in animal genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in crop genetic resources	NK	NK	NK	NK	NK	1	1	NK	NK
	Changes in forest genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in aquatic genetic resources	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	NA	1	NK	NK	NA	NK
	Changes in invertebrates genetic resources (associated biodiversity)	NA	NA	NK	NK	NA	NA	NA	NA	NA
	Changes in vertebrates genetic resources (associated biodiversity)	1	-1	NK	NK	NA	NA	NA	NA	NK
	Changes in plants genetic resources (associated biodiversity)	NA	NK	NK	NA	1	NK	NK	NA	NK

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

Within the livestock grassland based systems, increased numbers of livestocks herds will lead to increased pressure on the land with limited carrying capacity which will lead to overgrazing. In turn, there will lead to land degradation especially in the plateau areas which predispose the soil to erosion and gully formation with the on set of the rainy season seriously impacting on soil formation ecosystem services. The changes and measurements, however, have not been taken or assessed. Within the rainfed crops systems, crop diversification initiatives there has been integration of grain legumes in the cropping systems which have soil fertility improvement. The integration of tree crops through agroforestry have tended to improve soil formation and structure. Both in irrigated and rainfed crop production systems, changes in the vertebrates genetic resources (insects), an increase in the insects for instance such as fruit flies and aphids, which are vectors of particular diseases of particular crop has resulted in increased disease occurrence. Introduction of natural enemies in the control of stalk have resulted in the reduction of population of harmful insect pests. Increase in the population of bees and butterflies have resulted in the increased impact on pollination ecosystem services within the rainfed, irrigated and naturally regenerated forests production systems.

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 (Place pointer on the ecosystem service name for a detailed description)	**Actively managed species (name) and sub-species (where available)**	**Production systems (code or name)**	**Availability of diversity information (Y/N)**	**Source of information**
Pollination	Bees (Appis mellifera); A number of insect and bird species are such associated biodiversity providing this ecosystem service but no information available on whether or not these are actively managed	Naturally regenerated forests: Subtropics; Planted forests: Subtropics	N	Turpie et al (2015)
Pest and disease regulation	No information available on such associated biodiversity	N/A	N	-
Water purification and waste treatment	No information available on such associated biodiversity	N/A	N	-
Natural hazard regulation	No information available on such associated biodiversity	N/A	N	-
Nutrient cycling	A number of insect species and micro-organisms species are known to provide this ecosystem service but no information available as to whether or not these are actively managed	Rainfed and irrigated crops	N	-
Soil formation and protection	Earthworms	Naturally regenerated forests: Subtropics; Planted forests: Subtropics	N	-
Water cycling	No information available on such associated biodiversity	N/A	N	-
Habitat provisioning	No information available on such associated biodiversity	N/A	N	-
Production of oxygen/ Gas regulation	No information available on such associated biodiversity	N/A	N	-
Other [*please specify*]:				

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.

The country has established a decentralized national forest monitoring system; this is a national forestry monitoring system on changes in forest and forest carbon stocks. To fulfil this goal ten provincial forest monitoring laboratories have been established, equipped with Geographic Information Systems (GIS) and Geographical Positioning Systems (GPS) technology, to monitor and report on national changes in forest and forest carbon stocks. These measurements will be complemented by a database comprising field-based and remote sensing data compiled by the Integrated Land Use Assessment phase II (ILUA II)

programme, which has been technically synchronised with the NJP to feed into a national Monitoring Reporting and Verification (MRV) system. The national MRV system will contain both bio-physical and socio-economic components (GRZ & UN-REDD, 2010).

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. 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.

Associated biodiversity species	Degree of threat	Main threat	References or sources of information if available
Satyrium princeae Kraenzl.	VU D2	Threatened (Critically Endangered, Endangered, and Vulnerable)	Bingham, M (2011) Red data List Zambia
Vigna comosa Baker	VU D2	Threatened (Critically Endangered, Endangered, and Vulnerable)	Bingham, M (2011) Red data List Zambia
Ipomoea richardsiae Verdc. subsp. zambiensis Miller & Riedl	VU D2	Threatened (Critically Endangered, Endangered, and Vulnerable)	Bingham, M (2011) Red data List Zambia
Disa nyikensis H.P.Linder	VU D2	Threatened (Critically Endangered, Endangered, and Vulnerable)	Bingham, M (2011) Red data List Zambia
Cucumis humifructus Stent	VU D2	Threatened (Critically Endangered, Endangered, and Vulnerable)	(Golding, J.S. (ed.) 2002)
Vigna haumaniana R. Wilczek	VU D2	Threatened (Critically Endangered, Endangered, and Vulnerable)	(Golding, J.S. (ed.) 2002)
Vigna juncea Milne-Redh	VU D2	Threatened (Critically Endangered, Endangered, and Vulnerable)	(Golding, J.S. (ed.) 2002)
Vigna phoenix Brummitt	VU D2	Threatened (Critically Endangered, Endangered, and Vulnerable)	(Golding, J.S. (ed.) 2002)

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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.

Table 12. *Ex 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	Size of collection	Conservation conditions	Objective(s)	Characterization and evaluation status
Plants					

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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
Plants					

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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.

The country has developed a policy document for the recognition and maintenance of the traditional knowledge of genetic biodiversity and folklore. The traditional knowledge system of the country have received recognition at policy level. This is so because of the increased recognition of the traditional values in the preservation of cultural values of the country. Traditional knowledge has been used to inform conserve and use decision particularly involvement of local communities in the planning and conservation programmes in the forestry and fisheries sectors.

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.

The local communities play a significant role in the conservation, maintenance and sustainable use of biodiversity for food and agriculture be it crop genetic resources, livestock or forest genetic resources. There is an important role that local communities play in the conservation and preservation of associated biodiversity for present and future use. In this regard, the role of women is highly recognized as far as their involvement in the maintenance of the associated biodiversity. This could be explained by their key role in the maintenance and perpetuation of local crop genetic diversity of traditional crop varieties on farm from

season to season. Women play a big role in conserving staple food crops such such sorghum, millets and pulses such as beans, cowpeas and bambara nuts while the menfolk pay more attention to cash crops such cotton. This demonstrates the role of women in the maintenance of seed varieties for food crops. In terms of species harvested for food from the wild, comparatively women play a key role in the maintenance of wild plants. For the case of livestock, men assume responsibility for maintenance of cattle herds while women more often take the role of maintenance of small ruminants such as goats and chickens.

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
Edible orchids (Chikanda)	Disa spp	F2	-2	N	
Edible orchids (Chikanda)	Habenaria spp	F2	-2	N	
Edible orchids (Chikanda)	Satyrium spp	F2	-2	N	
Lusala	Dioscorea spp	F2	-1	N	
Masuku	Uapaca kakiana	F2	-1	N	
Mupundu	Perinari spp.	F2	-1	N	
Kasongole	Stryons sp	F2	-1	N	
Baobab	Adansonia digitata	F2	-1	N	
Livingstone potato	Plectranthus esculentus	F2	-1	N	
Amarula	Sclerocarya birrea	F2	-1	N	

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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. 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	References or sources of information if available
Disa spp	VU D2	Unsustainable harvesting	Bingham, M (2011) Red data List Zambia
Habenaria spp	VU D2	Unsustainable harvesting	Bingham, M (2011) Red data List Zambia
Satyrium spp	VU D2	Unsustainable harvesting	Bingham, M (2011) Red data List Zambia
Plectranthus esculentus		Semi cultivated	

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Provide information, where available, as to how the loss of wild food species affects the livelihoods of those that depend on them and on the general impact of their loss on food security and nutrition. Include references to the sources of information, if possible.

Wild food species provide the most important needed alternative source of food needs, food security and nutrition of local people in rural and peri urban areas of the country especially in times of need especially during periods of poor crop harvest of agricultural crops. Additionally, wild food species such as edible orchids, food beverages and certain fruits provide as a source of household incomes for the people in the rural and urban areas especially women. Therefore, loss of wild food species adversely impact on the livelihoods of the both the rural and urban people in terms of food and nutrition security. The loss of these species also means that the sole or alternative source of income is eroded for the rural and urban households especially women led households.

Conservation of wild resources used for food

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

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

Wild food species conserved (scientific name)	Size of collection (number of accessions and quantities)	Conservation conditions	Objective(s)	Characterization and evaluation status
None	None	None	None	None

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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
None	None	None	None	None

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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?

There are no formal activities that have been undertaken to maintain traditional knowledge of wild food species. There has been attempt to document the traditional knowledge relating to harvesting, maintenance and use of wild food species. However, traditional knowledge of wild food species continue to be passed on from generation to generation within communities.

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.

The information on gender dimensions with respect to the maintenance of and knowledge about wild food species relates mainly to plant genetic resources for food and agriculture. Generally, women are the custodians about wild food species since they are the ones who are directly involved in the gathering and have knowledge of the species and uses. As most of these wild food species are seasonal in nature, women have increased knowledge of when and where these are found in the wild. This also includes harvesting of wild plants for food and therefore have a role to play in the overseeing the ecosystem management. Men generally play an insignificant role in the maintenance of and knowledge about wild food species.

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)
Livestock diseases for cattle and local chickens	L2; L6	-2	-1
Drought affecting livestock and crop genetic resources	L2; C2; C6	-2	-1
Deforestation affecting naturally regenerated forests	F2	-2	-2

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)
Land degradation	L2; C2; C6;	-2	-2
Occurrence of floods	C2	-1	-1

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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.

Livestock diseases for cattle and chickens
Major diseases of cattle with an epidermic proportion, especially corridor disease, a tick borne disease, which has reduced the number of cattle, especially the Tonga breed in Southern Province by over 30% in the last ten years (Lungu, 2003). Sporadic outbreak of Newcastle disease which in some cases wipe indigenous poultry, especially local chickens, has occurred country wide. This affects people's livelihood due to loss of the breeding stock and therefore are compelled to start afresh and mainly source startup stocks from neighbours and relatives.

Occurrence of drought and floods
Climate – related disasters are recurring problems in Zambia. The country experienced a drought in 2005 while the subsequent years have had a mix of floods in some parts of the country while dry spells have been experienced in other parts of the country. Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) both look at building the resilience of Zambia and its communities. Institutions and plans to deal with climate related issues exist through disaster risk reduction arrangements. Further, the same actions that reduce disaster vulnerability will also help with adaptation to climate change. Both DRR and climate change adaptation require multi-sectoral approaches in order for them to fully achieve their objective. They cut across a lot of sectors, both social and economic, and therefore require good coordination arrangements.

The floods are seasonal and have caused complete loss of the field crops in the areas that have been affected by flooods especially along the Zambezi, Luangwa and other rive systems in the country.

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.**

With regard to plant genetic resources, there has been a loss of crop diversity which has reduced resilience to withstand environmental weather shocks such as increased incidences of occurrence of drought. The farmers in drought prone areas have tended to grow the drought tolerant varieties which in a way has resulted in the reduced diversity.

The evidence is that the area cultivated for the traditional crop varieties has remarkably reduced according to MAL/CSO Crop surveys for various years. According to Crop Forecast surveys, the percent of households using first generation maize seed has increased from 42% in 2001 to 61% in 2011. This has been attributed to both public investment through FISP and competitiveness of local seed industry in the country. According to CSO crop survey reports, the trend of sorghum production in a traditionally sorghum growing area, Western Province, has reduced from above 20,000 ha in 2004 to below 5000 ha in 2012.

In the case of livestock genetic resources, in the traditional areas of livestock of Southern and Western Province of Zambia the number of herds of cattle has reduced over time as a result of occurrence of diseases and recurrent drought in the regions. This has affect food production mainly because the local farmers use draft power for cultivation of crops and household incomes has lowered from sales of cattle. Sporadic outbreaks of Newcastle disease yearly and the resultant huge deaths of poultry, especially local chicken is a threat to poultry biodiversity across all parts of the country. This situation is worsened by recurrence of drought.

For the fisheries resources, the indigenous species has reduced as a result of unorthodox fishing methods used as evidenced by reduced catches. It has been documented by the Fisheries Department that for instance over years Tilapia catches has reduced tremendously over the period. Aquaculture affects fish biodiversity among others mainly through the escape of farmed fish into the wild. The Oreochromis niloticus that was at one time farmed in Mazabuka area, has for instance escaped into the Kafue River and has since is spread to all parts of the Kafue Flats. There may not only be competition between this species and the indigenous species of the area but hybridisation between the introduced species and the indigenous Oreochromis niloticus is taking place. This has most likely altered the genetic composition of the cichlid species of the Kafue Flats and the

catchment areas.

Deforestation has tended to destroy the habitats for the wild foods species. There has been a decrease in the availability of some wild foods due to wild spread deforestation caused largely by clearing land for agriculture. This destroys habitats for the wild food species. A number of farm blocks have been opened up for large scale commercial production (Ministry of Agriculture Reports).

Land degradation, which is largely caused by removal of top soil through erosion, makes the land unsuitable for crop production and therefore reduces the area for cultivation of food crops. In the low lying lands in Southern province, land degradation has been a serious problem which has been precipitated by overstocking leading to overgrazing.

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 a natural or human-made disasters. Describe and provide source of information.**

In terms of crop production and in the context of occurrence drought, sweet potato and cassava have been grown as cash crops given that the crops are drought tolerant and demand minimal external input. With the occurrence of persistent drought, small holder farmers are beginning to adopt more resilient crops such as sorghum, millets, sweet potato and cassava. The effects of drought in affected areas have been addressed by promoting crop diversification. This intervention has improved the food security situation in the affected communities.

In the event of farmers losing cattle, small-holder farmers have increased the scale of rearing small ruminants such as goats which besides serving as sources of food for the households, they also provide the much needed income. For livestock, there has been an increased food security and household incomes from the rearing of small ruminants such as goats in the absence of cattle that have been affected by livestock diseases. According to Tembo and Sitko (2013), the trend in the increase in the number goats countrywide from 1,000, 000 to 2,000,000 between the year 2000 and 2010.

In terms of fish, catches of buka buka has increased in Lake Tanganyika and the demand for the same has increased exponentially especially in cities and therefore it has become an important sources of income and livelihood especially for small scale traders in the country.

The non wood forest products such as caterpillars and wild fruits have become important commodities in the major towns and cities for generation of household income as an alternative to reduced traditional crops in the light of drought.

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)
Lantana camara	C2; F2	-1	-1
Mimosa pigra	A2; C2	-1	-1
Eichhornia crassipes	A2	-1	-1
Oreochromis niloticus	A2	-1	-1
Cherax quadricarinatus	A2	-1	-1
Salvinia molesta	A2	-1	-1
Azolla filiculoides	A2	-1	-1

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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.

Some introduced species have become very invasive and pose threats to ecosystems and their constituent indigenous flora. Among such weeds are lantana (Lantana camara) and Mimosa pigra. Lantana has become a serious weed in forest plantations in the Copperbelt area and at Victoria Falls World Heritage site in Livingstone. Lantana is known to negatively affect the regeneration of some indigenous species such as Bauhinia petersiana (Lwando and Chidumayo 2009). Although the potential distribution range of Lantana is projected to contract in Africa under the future climate scenarios, much of Zambia will remain suitable and highly suitable for this invasive species (Taylor et al.,2012) . Control of the Lantana weed is difficult because it regenerates both sexually and vegetatively, especially from roots.

Mimosa pigra, together with the indigenous Dichrostachys cinerea, have been expanding their range in the Kafue Flats, perhaps due to climate change and flood regime regulation, at the expense of some indigenous herbaceous plants and the grassland ecosystems (Indira, 2007) .

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.

Large scale cropping both under rainfed and irrigated crop production systems through the cropping of maize, soybeans and other major crops has contributed to the downscaling the spread of Lantana camara, an invasive alien species in the arable land. Being the annual crops, there is continuous cultivation and therefore putting on the control the proliferation of the invasive alien species.

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.

The similarities between the associated biodiversity i.e. the plant genetic resources, micro organisms, invertebrates and vertebrates are ecologically wide spread in nature, adversely impacted similarly by climate change.

Major differences among the associated biodiversity is the differences in the extent to which they have been considerations for their conservation and management. The crop genetic resources for instance have received adequate attention in terms of their conservation. To the contrary, associated biodiversity and wild food species have not had deliberate measures in place for their conservation and management.

The socio economic and cultural dimensions could be discussed in the contribution to the welfare of human. This so for crop genetic diversity to food and nutrition security through the crop improvement and development. Both livestock genetic resources and crop genetic diversity have a direct bearing on the livelihood of humans. When these resources are lost the food security of humans is directly affected.

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 major gaps in information and knowledge with respect to the state, trends and conservation of associated biodiversity and ecosystem services are: (i) Characterization data to describe the component of the associated components particularly the invertebrates and vertebrates. This in itself is a knowledge gap on the occurrence, distribution and richness of the associated biodiversity. (ii) Strategies for their conservation is lacking and therefore it is not easy to put in place conservation measures.

The main capacity or resources limitation include (i) Inadequate human resources capacity such as taxonomist (ii) There limited institution capacities, except for the public universities at individual level for teaching purposes. (iii) Financial resource limitation to build capacity such as laboratories for identification of the components

With regards to the main policy and institutional constraints (i) Lack of dedicated institutions to work on the associated biodiversity (ii) Inadequate institutional facilities such as laboratories for undertaking the much needed research agenda for the associated biodiversity (iii) Lack of specific national policy support for conservation of the associated biodiversity lenders these resources to be adequately attended at national level.

In terms of action required (i) strengthen the institutional and human resource capacity that will entail establishing new institutions to deal with associated biodiversity especially invertebrates and invertebrates which seem to be worst ignored. (ii) There is a need for policy and strategies to support the conservation of associated biodiversity.

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?
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?

Wild resources used for food are important resources whose contribution to the economy currently is not measured. The contribution of these resources in the provision of food, nutrition security and household income is in most cases overlooked at policy and institutional level. There have not been documentation of the contribution of these resources to the livelihoods and well being of the ecosystem. There is a need for deliberate policy and institutional measures to periodical undertake the state, trends and status of conservation of wild resources used for food.

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

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

There have not been documentation of the contribution of these resources to the livelihoods and well being of the ecosystem. However, there is a need for deliberate policy and institutional measures to periodical undertake the impact of natural or human-made disasters on biodiversity for food and agriculture with respect to major gaps in information and knowledge and what capacity and resource limitation and policy and institutional constraints.

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?

Zambia has reported invasive species affecting both terrestrial and aquatic biodiversity. Among the common species affecting terrestrial biodiversity include but not limited to Mimosa pigra; Lantana, camara; Argemone mexicana; Cardiospermum grandiflorum; Tithonia diversifolia and Tithonia rotundifolia. Like wise, aquatic biodiversity is affected by invasive species including Eichhornia crassipes; Pistia stratiotes; Nile tilapia (Oreochromis niloticus) and Crayfish (Cherax quadricarinatus).

The major gaps in information and knowledge with regard to invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment. The main policy and institutional constraints affecting the sector in the country may have a number of sectoral policies in place to address invasive alien species. However, the major weakness lies in the implementation of the policies. As the nation, the action required and priorities include an update of existing mapping of types and spread of invasive species in the country. In addition, there is need to develop and implement an updated programme for the control of invasive plant and fish species.

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.

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.

52. **For each of the production systems present in your country 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.**

In the 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 (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 systems	**Management practices** (Place pointer on the management practice name for a description)	**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)**
Livestock grassland-based systems: Subtropics	Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
	Integrated Pest Management (IPM)	NK	NK	NK
	Pollination management	NA	NA	NA
	Landscape management	NA	NA	NA
	Sustainable soil management practices	NA	NA	NA
	Conservation agriculture	NA	NA	NA
	Water management practices, water harvesting	NK	NK	NK
	Agroforestry	NK	NK	NK
	Organic agriculture	NA	NA	NA
	Low external input agriculture	NA	NA	NA
	Home gardens	NA	NA	NA
	Areas designated by virtue of production features and approaches	NK	NK	NK
	Ecosystem approach to capture fisheries	NA	NA	NA
	Conservation hatcheries	NA	NA	NA
	Reduced-impact logging	NA	NA	NA
	Other [*please specify*]:			
Livestock landless systems: Subtropics	Integrated Plant Nutrient Management (IPNM)	NA	NA	NA
	Integrated Pest Management (IPM)	NK	NK	NK
	Pollination management	NA	NA	NA
	Landscape management	NA	NA	NA
	Sustainable soil management practices	NA	NA	NA
	Conservation agriculture	NA	NA	NA
	Water management practices, water harvesting	NA	NA	NA
	Agroforestry	NA	NA	NA
	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	NA	NA	NA
	Ecosystem approach to capture fisheries	NA	NA	NA
	Conservation hatcheries	NA	NA	NA
	Reduced-impact logging	NA	NA	NA
	Other [*please specify*]:			
Naturally regenerated forests: Subtropics	Integrated Plant Nutrient Management (IPNM)	NA	NA	NA
	Integrated Pest Management (IPM)	NA	NA	NA
	Pollination management	NA	NA	NA
	Landscape management	NK	NK	NK
	Sustainable soil management practices	NA	NA	NA
	Conservation agriculture	NA	NA	NA
	Water management practices, water harvesting	NA	NA	NA
	Agroforestry	NA	NA	NA
	Organic agriculture	NA	NA	NA
	Low external input agriculture	NA	NA	NA
	Home gardens	NA	NA	NA
	Areas designated by virtue of production features and approaches	NK	NK	NK
	Ecosystem approach to capture fisheries	NA	NA	NA
	Conservation hatcheries	NA	NA	NA
	Reduced-impact logging	NK	NK	NK
	Other [*please specify*]:			
Planted forests: Subtropics	Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
	Integrated Pest Management (IPM)	NK	NK	NK
	Pollination management	NA	NA	NA
	Landscape management	NK	NK	NK
	Sustainable soil management practices	NK	NK	NK
	Conservation agriculture	NA	NA	NA
	Water management practices, water harvesting	NA	NA	NA
	Agroforestry	NA	NA	NA
	Organic agriculture	NA	NA	NA
	Low external input agriculture	NA	NA	NA
	Home gardens	NA	NA	NA

	Areas designated by virtue of production features and approaches	NA	NA	NA
	Ecosystem approach to capture fisheries	NA	NA	NA
	Conservation hatcheries	NA	NA	NA
	Reduced-impact logging	NK	NK	NK
	Other [*please specify*]:			
Self-recruiting capture fisheries: Subtropics	Integrated Plant Nutrient Management (IPNM)	NA	NA	NA
	Integrated Pest Management (IPM)	NA	NA	NA
	Pollination management	NA	NA	NA
	Landscape management	NA	NA	NA
	Sustainable soil management practices	NA	NA	NA
	Conservation agriculture	NA	NA	NA
	Water management practices, water harvesting	NA	NA	NA
	Agroforestry	NA	NA	NA
	Organic agriculture	NA	NA	NA
	Low external input agriculture	NA	NA	NA
	Home gardens	NA	NA	NA
	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	NA	NA	NA
	Other [*please specify*]:			
Culture-based fisheries: Subtropics	Integrated Plant Nutrient Management (IPNM)	NA	NA	NA
	Integrated Pest Management (IPM)	NA	NA	NA
	Pollination management	NA	NA	NA
	Landscape management	NA	NA	NA
	Sustainable soil management practices	NA	NA	NA
	Conservation agriculture	NA	NA	NA
	Water management practices, water harvesting	NA	NA	NA
	Agroforestry	NA	NA	NA
	Organic agriculture	NA	NA	NA
	Low external input agriculture	NA	NA	NA
	Home gardens	NA	NA	NA
	Areas designated by virtue of production features and approaches	NK	NK	NK

	Ecosystem approach to capture fisheries	NA	NA	NA
	Conservation hatcheries	NK	NK	NK
	Reduced-impact logging	NA	NA	NA
	Other [*please specify*]:			
Fed aquaculture: Subtropics	Integrated Plant Nutrient Management (IPNM)	NA	NA	NA
	Integrated Pest Management (IPM)	NA	NA	NA
	Pollination management	NA	NA	NA
	Landscape management	NA	NA	NA
	Sustainable soil management practices	NA	NA	NA
	Conservation agriculture	NA	NA	NA
	Water management practices, water harvesting	NA	NA	NA
	Agroforestry	NA	NA	NA
	Organic agriculture	NA	NA	NA
	Low external input agriculture	NA	NA	NA
	Home gardens	NA	NA	NA
	Areas designated by virtue of production features and approaches	NK	NK	NK
	Ecosystem approach to capture fisheries	NA	NA	NA
	Conservation hatcheries	NA	NA	NA
	Reduced-impact logging	NA	NA	NA
	Other [*please specify*]:			
Non-fed aquaculture: Subtropics	Integrated Plant Nutrient Management (IPNM)	NA	NA	NA
	Integrated Pest Management (IPM)	NA	NA	NA
	Pollination management	NA	NA	NA
	Landscape management	NA	NA	NA
	Sustainable soil management practices	NA	NA	NA
	Conservation agriculture	NA	NA	NA
	Water management practices, water harvesting	NA	NA	NA
	Agroforestry	NA	NA	NA
	Organic agriculture	NA	NA	NA
	Low external input agriculture	NA	NA	NA
	Home gardens	NA	NA	NA
	Areas designated by virtue of production features and approaches	NK	NK	NK
	Ecosystem approach to capture fisheries	NA	NA	NA
	Conservation hatcheries	NA	NA	NA

	Reduced-impact logging	NA	NA	NA
	Other [*please specify*]:			
Irrigated crops (other) : Subtropics	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	NA	NA	NA
	Conservation hatcheries	NA	NA	NA
	Reduced-impact logging	NA	NA	NA
	Other [*please specify*]:			
Rainfed crops : Subtropics	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	NA	NA	NA
	Conservation hatcheries	NA	NA	NA
	Reduced-impact logging	NA	NA	NA
	Other [*please specify*]:			

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.

There a number of management practices under the different production systems which favour the maintenance of biodiversity for food and agriculture. The extent to which these affect the maintenance of biodiversity in terms percentage of production area and change of production area and effect of these practices on biodiversity for food and agriculture as there has not been assessments carried out to measure these. Under the livestock grasslands production systems, management practices favoring biodiversity are integrated Integrated Plant Nutrient Management (IPNM), water management practices, water harvesting. Under naturally regenerated forests and planted forests production systems the key factors affecting biodiversity are areas designated by virtue of production features and approaches and reduced impact logging. Under self recruiting the factor of importance in the maintenance of biodiversity include areas designated by virtue of production features and approaches Ecosystem approach to capture fisheries and conservation hatcheries. Under both irrigated and rainfed crops production system the practices favouring the biodiversity are Integrated Plant Nutrient Management (IPNM), Integrated Pest Management (IPM), Sustainable soil management practices, Conservation agriculture, Water management practices, water harvesting Agroforestry, Organic agriculture, Low external input agriculture and Home gardens.

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

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.

Production systems	**Diversity based practices** (Place pointer on the diversity based practice name for a description)	**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)**
Livestock grassland-based systems: Subtropics	Diversification	NK	NK	NK
	Base broadening	NK	NK	NK
	Domestication	0	0	0
	Maintenance or conservation of landcape complexity	NK	NK	NK
	Restoration practices	NK	NK	NK
	Management of microorganisms	NA	NA	NA
	Polyculture/Aquaponics	NA	NA	NA
	Swidden and shifting cultivation agriculture	NA	NA	NA
	Enriched forests	NA	NA	NA
	Other [*please specify*]:			
Livestock landless systems: Subtropics	Diversification	NK	NK	NK

	Base broadening	NK	NK	NK
	Domestication	0	0	0
	Maintenance or conservation of landcape complexity	NK	NK	NK
	Restoration practices	NK	NK	NK
	Management of microorganisms	NA	NA	NA
	Polyculture/Aquaponics	NA	NA	NA
	Swidden and shifting cultivation agriculture	NA	NA	NA
	Enriched forests	NA	NA	NA
	Other [*please specify*]:			
Naturally regenerated forests: Subtropics	Diversification	NK	NK	NK
	Base broadening	NA	NA	NA
	Domestication	NA	NA	NA
	Maintenance or conservation of landcape complexity	NK	NK	NK
	Restoration practices	NK	NK	NK
	Management of microorganisms	NA	NA	NA
	Polyculture/Aquaponics	NA	NA	NA
	Swidden and shifting cultivation agriculture	NA	NA	NA
	Enriched forests	NK	NK	NK
	Other [*please specify*]:			
Planted forests: Subtropics	Diversification	NK	NK	NK
	Base broadening	NK	NK	NK
	Domestication	NA	NA	NA
	Maintenance or conservation of landcape complexity	NK	NK	NK
	Restoration practices	NK	NK	NK
	Management of microorganisms	NA	NA	NA
	Polyculture/Aquaponics	NA	NA	NA
	Swidden and shifting cultivation agriculture	NK	0	NK
	Enriched forests	NA	NA	NA
	Other [*please specify*]:			
Self-recruiting capture fisheries: Subtropics	Diversification	NK	NK	NK
	Base broadening	NA	NA	NA
	Domestication	NA	NA	NA
	Maintenance or conservation of landcape complexity	NA	NA	NA

	Restoration practices	NK	NK	NK
	Management of microorganisms	NA	NA	NA
	Polyculture/Aquaponics	NK	NA	NA
	Swidden and shifting cultivation agriculture	NA	NA	NA
	Enriched forests	NA	NA	NA
	Other [*please specify*]:			
Culture-based fisheries: Subtropics	Diversification	NK	NK	NK
	Base broadening	NA	NA	NA
	Domestication	NA	NA	NA
	Maintenance or conservation of landcape complexity	NA	NA	NA
	Restoration practices	NA	NA	NA
	Management of microorganisms	NA	NA	NA
	Polyculture/Aquaponics	NK	NK	NK
	Swidden and shifting cultivation agriculture	NA	NA	NA
	Enriched forests	NA	NA	NA
	Other [*please specify*]:			
Fed aquaculture: Subtropics	Diversification	NK	NK	NK
	Base broadening	NA	NA	NA
	Domestication	NA	NA	NA
	Maintenance or conservation of landcape complexity	NA	NA	NA
	Restoration practices	NA	NA	NA
	Management of microorganisms	NA	NA	NA
	Polyculture/Aquaponics	NK	NK	NK
	Swidden and shifting cultivation agriculture	NA	NA	NA
	Enriched forests	NA	NA	NA
	Other [*please specify*]:			
Non-fed aquaculture: Subtropics	Diversification	NK	NK	NK
	Base broadening	NA	NA	NA
	Domestication	NA	NA	NA
	Maintenance or conservation of landcape complexity	NA	NA	NA
	Restoration practices	NA	NA	NA
	Management of microorganisms	NA	NA	NA
	Polyculture/Aquaponics	NK	NK	NK

	Swidden and shifting cultivation agriculture	NA	NA	NA
	Enriched forests	NA	NA	NA
	Other [*please specify*]:			
Irrigated crops (other) : Subtropics	Diversification	NK	1	1
	Base broadening	NK	1	1
	Domestication	NA	NA	NA
	Maintenance or conservation of landcape complexity	NK	NK	NK
	Restoration practices	NA	NA	NA
	Management of microorganisms	NK	NK	NK
	Polyculture/Aquaponics	NA	NA	NA
	Swidden and shifting cultivation agriculture	NK	1	1
	Enriched forests	NA	NA	NA
	Other [*please specify*]:			
Rainfed crops : Subtropics	Diversification	NK	1	1
	Base broadening	NK	1	1
	Domestication	NA	NA	NA
	Maintenance or conservation of landcape complexity	NK	NK	NK
	Restoration practices	NA	NA	NA
	Management of microorganisms	NK	NK	NK
	Polyculture/Aquaponics	NA	NA	NA
	Swidden and shifting cultivation agriculture	NK	1	1
	Enriched forests	NA	NA	NA
	Other [*please specify*]:			

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.

In livestock grasslands systems, diversification and base broadening have increased the biodiversity of livestock both under grassland and landless livestock production systems. There has been an increase in the number of small ruminants such as goat. Under the landless, there has been an increase in the livestock species beyond chicken which include guinea fowls, quails, ducks, turkeys. With regard to base broadening there has been an increase with regard to cross breeding between local and exotic cattle breeds which is aimed at increasing the productivity of cattle under traditional production systems and improved resilience in terms of tick borne-diseases. Restoration programmes for livestock have been effective in sustaining livestock and cattle production especially among small holder farmers whose herds have decimated due to diseases.

Maintenance and restoration practices are the main diversity based practices under the natural forests production systems. Natural forests where deforestation has occurred which have been neglected or over-logged are being resuscitated through the restoration efforts. The measures include involvement of communities to promote sustainable harvesting.

Diversification and base broadening are the main diversity practices under the planted forest production systems. Diversification entails introduction of other species other than the traditionally known species such as Eucalyptus and pines and include

indigenous forest species. In terms of base broadening, new varieties of the tree species are introduced. This involves establishment of tree nurseries and using these to replant the degraded forest areas. In the forest the restoration practice will increase the availability of wild food species such as fruit trees.

In self recruiting, restoration is the main diversity practice. This involves replenishing the fisheries areas that are depleted such as Lake Mweru-Luapula. Replenishment entails raising fingerings of affected fish species and introduce these in the affected water bodies.

Diversification, base broadening and shifting cultivation are the main diversity based practices under the irrigated and rainfed crop based production systems. Diversification entails the introduction of increased number of crop species in the crop system. In Zambia this has involved introducing crop species in addition to maize including grain legumes, oil seed crop and root and tuber crops. This has contributed to enhancing food security. There is a wide range of improved crop varieties that have emerged through increased combined effort of the public and private sectors. This has led to increased productivity of the biodiversity for food and agriculture and consequently improving food security at household and national levels.

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 fisherfolk involved, state and outcome with respect to components of biodiversity for food and agriculture.**

The specific national programmes or projects that have been undertaken in the country to support the various components of biodiversity for food and agriculture include:

(i) Integrating agroforestry in livestock grassland based production system

(ii) The disease control programme for control of livestock diseases and vaccination (CBP) through construction of deep tanks in Southern, Central, Western and Eastern Provinces. This is being done through World Bank supported Programme and part of pest integrated management. Livestock disease control measures such as massive vaccinations, cordon line construction, livestock movement ban.

(iii) Regulating logging of timber and management of forest reserves

(iv) Government programme to reduce over-harvesting of Mukula tree in the national forest reserves.

(v) Prevention of fires through fire guards as landscape management in the forest reserves.

(vi) Tree planting programme to resuscitate national forests. This is a Government programme as a national undertaking for the reforestation of the country.

(v) Forestry, Climate Change and Natural Resource Management Projects in Zambia, Government of Finland: Decentralized Natural Resource Management Programme.
This programme is operating in four to five clusters comprising two to three districts with initial budget estimates of 700,000 Euro per district over a four-year period. The total budget is expected to be 10 to 13 million Euro over the period (2013–2017). Activities consist of four components: (1) local natural resource management; (2) district, chiefdom and community development; (3) research and development; (4) programme coordination, support and policy.

(vi) Pilot Programme on Climate Resilience
This project seeks to promote private sector investment in climate change adaptation in a range of economic sectors (agriculture, water and energy) within the Kafue and Barotse sub-basins, including (1) micro-finance; (2) weather index-based insurance projects: (3) information dissemination systems; (4) strengthening capacity for climate resilient activities.

(vii) UNDP/GEF Multi-Focal Area Project: Strengthening Management Effectiveness and Generating Multiple Environmental Benefits within and around Protected Areas in Zambia
This project seeks to ensure that the biodiversity and carbon sinks of Zambia are better protected from threats through improved management effectiveness at the institutional level, sustainable forestry management practives and integrated land use planning at the local level, and application of appropriate low-carbon, biomass-energy technologies.

(viii) Low Emission Capacity-Building, EU-UNDP: Climate Change Capacity-Building Programme
The objective of this programme is to develop capacities (institutional, financial, human and research) required for articulation of a low-carbon, climate-resilient development pathway.

(ix)BioCarbon Partners, Lower Zambezi and Luangwa REDD+ Projects
BioCarbon Partners is conducting Zambia's first REDD+ project in the Lower Zambezi and is expanding its activities into the lower Luangwa Conservancy and other regions surrounding the South Luangwa National Park supported by USAID.

(x) Lake Tanganyika biodiversity conservation project.
This is a trans boundary project that is aimed conserving the highest diversity of fisheries resources in the regional water bodies of Lake Tanganyika. This against the background of depleted fish stocks in the national water bodies.

(xi) Community fisheries conservation programme
Through the government initiative, there is the promotion of community involvement in the conservation of fisheries genetic resources in the country.

(xii) Government imposed fish ban countrywide in the water bodies.
This is a deliberate yearly undertaking supported by national legislation specifying the period of November to January to allow for the breeding of the fish in the natural water bodies. This is enforced through regular patrols and checks at road blocks and in market places.

(xiii) Replenishment or restocking of the water bodies with finger rings which is linked to the conservation hatcheries.
The WorldFish Center was commissioned jointly by a private sector client and UNDP under the Growing Sustainable Business initiative to undertake a consultancy with the following objectives: (i) develop a Fingerling Distribution Model that would facilitate pro-poor aquaculture in Zambia for the specific client; (ii) describe a generic template for a distribution model that could be adopted by other fingerling suppliers in Zambia; and (iii) describe the market, policy, infrastructural and institutional support requirements for the successful introduction of a pro-poor fingerling distribution model in Zambia, and opportunities for collaboration with state and non-state institutions, which could respond to such requirements.

(xvi) Integrated soil fertility management projects within the sustainable soil management programme.
Soil fertility initiatives to combat soil degradation through agro forestry and organic fertilizer is a programme that Zambia has is implementing to achieve sustainable food production and enhancing agricultural productivity, farmers' incomes and in part as a response to climatic change.

(xv) Conservation farming unit promoting conservation farming practices especially in agro ecological regions I and II of Zambia in the face of moisture stress arising from recurrence of drought.
Conservation farming (CF) offers a set of sustainable agronomic practices for Zambian small holder farmers using either hand hoe or animal draft tillage. The CF package includes dry-season land preparation using minimum tillage methods (hand hoe basins or ADP ripping), crop residue retention, precision input application (in a precise grid of planting basins or along rip lines), and nitrogen-fixing crop rotations. These practices aim to improve soil structure and water retention and reduce the need for chemical fertilizers while at the same time increasing crop yield.

(xvi) COMACO project in Muchinga and Eastern Provinces.
The project aims at promoting conservation agriculture, marketing and value addition to the commodities such as groundnuts and is currently operating in Muchinga and Eastern Provinces of Zambia.

(xvii) OPPAZ programme and a number of NGOs promoting organic agricultural practices for high value crops both as rainfed and under irrigation.

(xviii) Promoting agroforestry species as sources of organic fertilizers in Eastern province through support by ICRAF

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	Y	Though undocumented, use of artificial fertilizers for crop production has contributed to the degradation of the soils and pollution of underground water.	
Over-use of chemical control mechanisms (e.g. disease control agents, pesticides, herbicides, veterinary drugs, etc.)	Y	This apparent in the river system where effluent is discharged from the mining industry	
Inappropriate water management	Y	Unsustainable utilization of both surface and ground water pose a threat to the water resources and consequently associated biodiversity.	
Practices leading to soil and water degradation	Y	Monocropping arising from cropping of a single crop year after year has adversely affected the soil productivity.	
Over-grazing	Y	This practice is common and associated with communal grazing where overstocking has led to soil degradation and unproductivity of the soils which are susceptible to soil erosion.	
Uncontrolled forest clearing	Y	It is apparent and synonymous with the clearing the forest for settlement, agriculture and charcoal burning. These practices have led to desertification and in turn reduced rainfall activities.	
Fishing in protected areas	Y	Fishers usually do not comply with the fish ban, a period during which fishing activities have been banned to allow for the breeding of the fish. In some cases, the fishing methods used are non-discriminatory leading to the productive fish being extinct.	
Overharvesting	Y	Overharvesting of the wild plants and other biodiversity for food and medicinal use lead to decimating of these components in the wild.	
Other [*please specify*):			

Add row

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

In the crop sector, in order to promote sustainable soil and water management practices, there is a deliberate programme for promotion of conservation farming (CF), which offers a set of sustainable agronomic practices for Zambian small holder farmers. The CF package includes dry-season land preparation using minimum tillage methods (hand hoe basins or ADP ripping), crop residue retention, precision input application (in a precise grid of planting basins or along rip lines), and nitrogen-fixing crop rotations. These practices aim to improve soil structure and water retention and reduce the need for chemical fertilizers while at the same time increasing crop yield.

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

Implementation of sensitization, community-based and educational programmes in places through the local leadership and farmer groups targeting the local communities. The programme activities are aimed at empowering the local people with the knowledge on the importance of sustainable use of associated biodiversity and wild foods. These interventions focus on the need for sustainable harvesting of the wild food plant species in order to perpetuate them for future generations.

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.**

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	Extent of problem (2,1)	Effect on food security and nutrition	Effect on livelihood	Reference
Livestock grassland based systems-Subtropics	livestock species	2	Decrease food security and nutrition	Diminishing	MAL/CSO reports
Naturally regenerated Forests-Subtropics	Plant genetic resources	2	Reduced availability of non wood forest products e.g. Honey, caterpillars, edible orchids	Reduced	Forestry reports
Self-recruiting capture fisheries - Subtropics	Fish species	2	Reduced food security and nutrition	Reduced	Fisheries reports
Rainfed crops-Subtropics	Crop species	2	Significant	Reduced	MAL/CSO reports

Add row

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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;**
- **b) food security and nutrition;**
- **c) rural livelihoods;**
- **d) ecosystem services;**
- **e) sustainability;**
- **f) resilience;**
- **g) sustainable intensification.**

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.

(i) Rainfed and irrigated Crop production systems
To address productivity, through research focusing on crop improvement a number of varieties that are superior in performance with respect to yield and possess other preferred attributes such as disease resistance and nutrition quality have been made available to farmers. A number of activities to promote their adoption have been undertaken. Activities have been undertaken to support seed delivery systems and promote on farm seed multiplication especially for crops that are remotely promoted by the formal seed system. The farmer input support programme has also helped to improve accessibility by farmers to the developed crop varieties.

The promotion of improved crop varieties in the production of staple foods such as maize, cassava and sorghum have led to improved food and nutrition security. Specific action to improve nutrition have been through the development of varieties that are rich in micronutrients such as vitamin A and micro-nutrients. Bio fortification has been involved for maize and sweet potato for vitamin A; beans for micro nutrients such as iron and zinc.

Resilience in the crop improvement has been improved by development of crop varieties that are tolerant to incidences of drought.

(ii) Grasslands and landless livestock production systems
A programme for promotion of small ruminants such as goats and local chicken through the "pass on system has improved productivity, food security and rural livelihoods. Through the intervention of government and NGOs there is ". The government, through support from World Bank, has established the livestock breeding centres in all the provinces which aims at improving livestock productivity sector.

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).**

Provide explanations and additional information as regards the gender differences in the patterns of use, management and consumption of wild food, including data disaggregated by sex.

The national biodiversity study estimated that one-third of rural households harvest wild food resources in form of fruits, mushroom and root/tubers with a gross annual output of about 31 kg per household. Overally, harvested forest products make a significant contribution to incomes of the rural poor people. Forest contribution to rural household income is estimated at 20.6 percent (Puustjärvi, Mickels-Kokwe and Chakanga, 2005). The harvesting and use of wild foods for subsistence, supplementing and nutrition among the rural households is wild spread. However, there no information on proportion of the population of the country that uses the wild foods on a regular basis for food and nutrition. It has been observed that in time of scarcity, there is an increase to the extent to which the wild food species are used for food and nutrition.

The adoption of ecosystem approaches

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

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

Production system	Ecosystem approach adopted (name)	Extent of adoption (2,1,0,NA)	Importance assigned to the ecosystem approach (2,1,0,NA)
Naturally Regenerated Forest - Subtropics	Sustainable Forest management	1	2

Production system	Ecosystem approach adopted (name)	Extent of adoption (2,1,0,NA)	Importance assigned to the ecosystem approach (2,1,0,NA)
Self-recruiting Capture - Subtropics	Ecosystem approach to fisheries management	1	2
Rainfed Crops- Subtropics	Sustainable crop production (e.g. integrated soil fertility management system, integrated pest management, water harvesting, crop diversification, low external inputs)	1	2

Add row
Delete row

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;**
- **d. Lessons learned.**

Self-recruiting Capture and Naturally regenerated forest - Subtropics
(a)The specific actions that have been taken to ensure adoption largely include involvement of local communities and traditional leadership in the implementation of the interventions.

(b) These are relatively new approaches and as such the results from adoption are yet to be observed.

Rainfed crops
Conservation agriculture (CA) and integration of agroforestry have been intensively promoted over the past 10 years especially in agro ecological I & II and there are plans to expand these practices to agro ecological region III. The observed results under CA include improved productivity and resilience to droughts compared to convention practices.

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?**
- **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 major gaps in information and knowledge with respect to the use of management practices or actions that favor or involve the use of biodiversity for food and agriculture are that in agroforestry management practices the unavailability of indigenous species that can be used in agroforestry practices; limited studies on the cost benefit associated with the CA and agroforestry practices. The long term effect on soil properties remain unknown.

The main capacity or resources limitation include (i) Inadequate human resources capacity (ii) There limited institution capacities, except for the public universities at individual level for teaching purposes. (iii) Limitation of research facilities

With regards to the main policy and institutional constraints (i) Lack of dedicated institutions (ii) Inadequate institutional facilities such as laboratories for undertaking the much needed research agenda (iii) Limitation of specific national policy support for promotion of management practices beyond specific projects at national level.

In terms of action required (i) strengthen the institutional and human resource capacity that will entail establishing new institutions to deal with associated biodiversity especially invertebrates and invertebrates which seem to be worst ignored. (ii) There is a need for policy and strategies to support the conservation of associated biodiversity.

63. **With respect to the 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?**

With regard to major gaps in information and knowledge for sustainable use of biodiversity for food and agriculture, there is no basis for measurement of the gains and indeed the setting up of yard sticks or bench marks or baselines against which could be used to determine sustainable use. The main capacity or resource limitations are human and financial limitations for monitoring the use pattern of biodiversity for food and agriculture. There is a need for deliberate policy and institutional measures to be in place for monitoring sustainable use of biodiversity for food and agriculture. In this regard, training, generation of benchmark data and development of measurable indicators to enable monitoring sustainable use.

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?**
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?**

Due to limitation of technology and advanced techniques, the available genetic resources are not optimally exploited and used by the users who mainly are breeders and researchers. There is generally little understanding of the value of the role that the ecosystem services such as pollination ecosystem services; there is limited information on the value of local crop species and wild foods. The capacity or resources limitations and main policy and institutional constraints are the same as in sustainable use.

65. **With respect to the adoption of ecosystem approaches:**
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 major gaps in information and knowledge with regard to ecosystem approaches is the clear understanding the components of the ecosystem services functions and therefore it becomes difficult to measure adoption with regard to ecosystem approaches. For instance, in crop production systems, pollination, pest and disease regulation there are gaps in understanding natural enemies and interactions among the different components. The main policy and institutional constraints affecting the sector in the country may have a number of sectoral policies in place to address clear understanding of ecosystem approaches. As the nation, the action required and priorities include ecosystem approaches in the education landscape of the country. The ecosystem approaches require to be defined and their functionality clearly outlined.

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, programmes 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;
b. Support the conservation and sustainable use of associated biodiversity;
c. Address food security and nutrition with explicit reference to biodiversity for food and agriculture, associated biodiversity and/or wild foods;
d. Address the maintenance of ecosystem services with explicit reference to biodiversity for food and, associated biodiversity and/or wild foods;
e. Improve resilience and sustainability of production systems with explicit reference to biodiversity for food and agriculture, associated biodiversity and/or wild foods;
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.

A number of national policies, programmes and enabling frameworks are in place that support or influence conservation and sustainable use of biodiversity for food and agriculture and the provision of ecosystem services. These are being described below for each of the provided objectives.

A. Support the integrated conservation and sustainable use of biodiversity for food and agriculture across sectors;

(i) Lake Tanganyika Integrated Management Programme (LTIMP) (2009)
The LTIMP is aimed at realizing effective and sustainable management of Lake Tanganyika and other natural resources within the basin with the end objective of contributing to sustainable conservation of the biodiversity of the lake basin as a trans-border natural resource. The Zambian component of the UNDP/GEF –supported Lake Tanganyika Integrated Management Programme (LTIMP) focuses on sedimentation control, which is within the framework of priorities of the sub-regional Strategic Action Programme (SAP). In the SAP, the control of sediment inflows from the steep mountainous terrain bordering Lake Tanganyika in both Mpulungu and Kaputa Districts is seen as one of the most important areas for support. Over-fishing has also been identified as a key issue, and this is being addressed through co-finance and technical cooperation from the African Development Bank, FAO and other partners of the Lake Tanganyika Integrated Management Programme. Sediment inflows are being reduced through an increase in the area of land brought under sustainable land use, particularly for agriculture and forestry. Emphasis is on institutional strengthening with support to community participation in agriculture, forestry, and soil-

erosion prevention. Best practice and innovation, as well as regional coordination and dissemination of lessons is assured by linking the project to the World Agro-forestry Centre (ICRAF)'s training and demonstration programmes as a regional activity.

B. Support the conservation and sustainable use of associated biodiversity;

(i) National Adaptation Programme of Action on Climate Change (2007)
The aim of the programme is to improve the conservation of biodiversity to mitigate the impacts of climate change and promote resilience among local communities and businesses.

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

(i) National Agriculture Investment Plan (2013)
The aims to improve land-use planning and enhance community participation in integrated land-use systems (land administration and management); ensure efficient water use and management; promote afforestation, community woodlots and agroforestry; promote efficient energy use from natural resources; promote sustainable capture fisheries management; and promote sustainable crop and livestock production.

D. Address the maintenance of ecosystem services with explicit reference to biodiversity for food and, associated biodiversity and/or wild foods;
(i) National Forest Policy (2014)
The relevant specific objectives that this policy aspires to address include: ensuring the integrity, productivity and the development potential of the forest resources; ensuring adequate protection of forests, by empowering local communities and promoting the development and use of wood, non-wood forest products and services; ensuring sustainable management of forest ecosystems and biodiversity through the application of both scientific and local knowledge; improving the role of forests in the provision of ecosystem services and abatement of climate change; and to ensure the establishment and sustainable management of forest resources for wood fuel production.

(ii)National Tree Planting Programme (2013)
The aim of the programme is to plant a total of 2,000 ha of exotic tree plantation, as well as community woodlots, in each of the 10 provinces. Additional objectives include improving protection of ecosystem services such as watershed management and biodiversity conservation through reduced pressure on indigenous forests.

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

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.

(i) Fisheries Act (2011)
The Act promotes the sustainable development of fisheries and a precautionary approach in fisheries management, conservation, utilization and development; establish fisheries management areas and fisheries management committees; provide for the regulation of commercial fishing and aquaculture.

67. **List up to 10 major policies, programmes and enabling frameworks in your country that enhance the application of an ecosystem approach or a landscape approach 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.**

(i) National Adaptation Programme of Action (NAPA), 2007
Evaluates the likely impacts of climate change on relevant sectors in Zambia and uses a multi-criteria analysis to rank the most urgent needs identified in order to generate a prioritized list of ten adaptation interventions. The following NAPA priorities identified are relevant to REDD+: i) strengthening of Early Warning Systems (EWS) to improve services to preparedness and adaptation to climate change in all the sectors (agriculture, health, natural resources, and energy); ii) promoting alternatives sources of livelihoods; iv) managing critical habitats; and v) promoting natural regeneration of indigenous forests.

(ii) Vision 2030
Sets out possible long-term alternative development policy scenarios and goals that are likely to contribute to the attainment of favourable socio-economic indicators by 2030. Specifically, Vision 2030 aims to ensure that Zambia develops into a 'prosperous

middle-income nation', which forms part of the aspirations of the Zambian population. To achieve middle-income status, Zambia's socio-economic development objectives are to: i) attain and sustain annual real economic growth rates of between 6-10%; ii) attain and maintain a moderate inflation rate of 5%; iii) reduce the annual population growth rate from its 2005 rate of 2.9% to a rate of less than 1% over the next 25 years; iv) reduce the incidence of poverty to less than 20%; v) reduce income inequalities measured by a Gini coefficient of less than 40; and vi) provide secure access to safe potable water sources and improved sanitation facilities to 100% of the population in both urban and rural areas.

(iii) National Biodiversity Strategy and Action Plan, 1999
Aims to ensure the conservation of a full range of the country's natural ecosystems through a network of PAs and conservation of genetic diversity of crops and livestock. The plan also aims to improve the legal and institutional framework and human resources to implement the strategies for: i) conservation; ii) sustainable use; and iii) equitable sharing of benefits from biodiversity.

(iv) Fifth National Development Plan (FNDP), 2006-2010
Aims to i) attain food security for the majority of households with at least 90% of the population being food secure by 2010; ii) increase the contribution of the agricultural sector to total foreign exchange earnings from the current 3-5% to 10-20% by 2010; iii) attain growth in the agricultural sector of 10% per annum from 2006 onwards; iv) increase the overall agricultural contribution to GDP from 18-20% to 25% by 2010; and v) increase incomes for those involved in the agricultural sector.

(v) Zambia Forest Action Plan (ZFAP), 1995
Establishes: i) a framework for strategic planning in forestry; ii) raises awareness of issues related to the forest sector; iii) contributes to the preparation of/updates to the forest policy, as well as other forestry action plans and programmes.

(vi) National Environmental Action Plan (NEAP), 1994
Provides an overview of: i) the county's environmental problems; ii) existing legislation and institutions; and iii) strategy options for improving environmental quality. Environmental problems identified include soil degradation, deforestation, water pollution and inadequate sanitation, air pollution, wildlife depletion.

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.

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.

(i) Food Relief Programme by government and some international agencies such as World Food programme
(ii) Restoration of agricultural systems in disaster affected areas which have experienced complete crop failure. The seeds are distributed to the affected household for free.
(iii) Resettlement Programme in which demarcated land is used to resettle people for purposes of carrying out agricultural production.
(iv) Creation of national farm blocks, where such things like tree planting is promoted.

(v) Restocking of cattle herds to overcome the depletion caused by deaths from livestock diseases
(vi) Programme for promotion of fish farming
(vii) Promotion of Crop diversification in order to increase resilience in the farming system.

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.).

(i) Promotion of Crop diversification in order to elevate resilience

(ii) Promotion of conservation agriculture
(iii) Climate change adaptation strategies as indicated in the NAPA of 2007
(iv) National irrigation policy
(v) National Adaptation Programme of Action of 2007
(vi) National Biodiversity Strategic Action Plan of 2015
(vii) Lake Mweru/Luapula: Conservation and Management Action Programme (1992 - present)
(viii) Zambia Forest Action Plan (ZFAP)
(ix) National Climate Change Response Strategy (NCCRS) 2010, provides a comprehensive national institutional and implementation framework through which climate change awareness programme are co-ordinated and financed.

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)?**

Zambia developed its National Biodiversity Strategy and Action Plan (NBSAP) in 1999 and this has guided the implementation of the objectives of the Convention on Biological Diversity (CBD) over the years. However, changes in the country's development paradigm has necessitated revision of the NBSAP so that it is in harmony with recently developed international instruments such as the Nagoya Protocol consistent with our prevailing national development agenda. In addition, at the global level, emerging issues such as the shift from Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs) mean that our strategy in addressing challenges of biodiversity need to reflect these new challenges.

The NBSAP in Zambia is a national administrative framework that serve to comply with article 6 of the CBD. It is a strategic framework for the conservation and management of biodiversity in Zambia. It includes the conservation of crops and livestock diversity, forestry sector, and associated biodiversity as well as sustainable use of the components of biodiversity. There is an inter-Ministerial Steering Committee and the overall coordination is under the Ministry responsible for the Environment.

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
Plant genetic resources (associated biodiversity)	Lack of appreciation of the importance of plant genetic resources hence are given low priority in terms of development of legislation for their protection.
Microorganisms	The value of microorganisms as associated biodiversity is not significantly appreciated. Therefore, they receive low attention in terms of development of specific legislation for their conservation both in situ and ex situ.
Vertebrates	Lack of appreciation of the importance in production systems result in low priority in terms of their protection.
Invertebrates	Their value is insignificantly known and appreciated, hence receiving little attention in terms of what needs to be done to protect them.

Add row
Delete row

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.

Lack of appreciation of the importance of plant genetic resources for food and agriculture has resulted in attaching low priority in terms of development of legislation for their protection. Additionally, due to limited characterization of plant genetic resources for food and agriculture, the extent of diversity in little known and therefore, their use in crop improvement programmes has been very limited. In order to raise the profile of plant genetic resources, concerted effort has been in place for national awareness creation at all levels including at policy and technical levels. There has been some effort to undertake characterization of

collected and conserved plant genetic resources for food and agriculture. Awareness creation on the value of other associated biodiversity targeting also the local communities and traditional leadership require scaling up in order to increase support for their conservation and sustainable use.

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.**

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)
Plant genetic resources	crop research and development	Y
Microorganisms	any use	Y
Invertebrates	any use	Y
Vertebrates	any use	Y

Add row

Delete row

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.**

Though yet to be enacted into law, the country has developed the National Policy on Indigenous Knowledge Systems in Zambia. Through this policy, the country has developed a bill on traditional knowledge, genetic resources and Folkrole has been developed but yet to be enacted into law. Through this draft bill, appropriate guidelines that will facilitate the eventual integration of Indigenous Knowledge, Genetic Resources and Folklore in national developmental programmes. With respect to the genetic resources, the objectives of the policy are to ensure the management, conservation and sustainable utilization of local and indigenous genetic resources; regulate and control access to and utilization to genetic resources and related knowledge; develop and or strengthen mechanisms for equitable and fair sharing of benefits arising out of use of genetic resources and associated indigenous knowledge; increase understanding and appreciation of the value of genetic resources and associated knowledge and; encourage propagation of genetic resources threatened with extinction.

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.

The country has put in place the Clearing House Mechanism (CHM) within the NBSAP, which is supposed to provide linkages between sector information systems on biodiversity for food and agriculture. Its operationalization is yet to be seen but currently it is not functional.

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
SADC Documentation and Information System (SDIS)	Plant genetic resources	The SDIS has been developed through the SADC Plant Genetic Resources Network for documenting the national and regional holdings of plant genetic resources for food and agriculture

Add row

Delete row

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.

The country, through the SADC Plant Genetic Resources Centre, has established the information system known as the SADC Documentation and Information System that partly is intended to maintain traditional knowledge associate with biodiversity for food and agriculture. The prototype information system is applied at the regional level and there efforts to have the system web-based to permit global access of information.

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.**

Broadly speaking small holder farmers at household level and lately being organized in farmer associations are involved in the conservation of biodiversity for food and agriculture. The National Plant Genetic Resources Centre, a Governmental unit mandated to conserve plant genetic resources for food and agriculture, has been working with local extension offices and with involvement of local communities in Lusitu, Rufunsa, Situmbeko and Chikankata driving the process and promotion of on farm conservation of local crop genetic diversity with involvement of local communities. A few NGOs or civil society organizations such as Biodiversity Community Network (BCN) and Community Technology Development Trust (CTDT) are also actively involved in the conservation of biodiversity for food and agriculture through restoration programmes, advocacy, education and imparting best practices for sustainable use of biodiversity for food and agriculture.

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.**

There no incentives or benefits to support activities for the conservation and sustainable use of biodiversity for food and agriculture or associated biodiversity.

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.

(i) Strengthening community based on farm conservation and sustainable use of crop diversity in semi-arid Zambezi Gwembe Valley of Zambia. This was implemented by Biodiversity Community Network (BCN), an NGO involved in capacity building of communities in biodiversity conservation and use. The project was supported under the Benefit Sharing Fund under the Treaty. It focused on the conservation of crop diversity and strengthening the local seed systems involving sorghum, pearl millet, cowpea, bambara nuts

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	Description of sites and their characteristics of relevance to biodiversity for food and agriculture	Extent (area)
The lower Zambezi basin Programme	The conservation of unique fauna and flora of the region.	Southern Province of Zambia
Lake Tanganyika Integrated Management Programme	The Zambian component of the UNDP/GEF –supported Lake Tanganyika Integrated Management Programme (LTIMP) focuses on sedimentation control, which is within the framework of priorities of the sub-regional Strategic Action Programme (SAP). In the SAP, the control of sediment inflows from the steep mountainous terrain bordering Lake Tanganyika in both Mpulungu and Kaputa Districts is seen as one of the most important areas for support. Over-fishing has also been identified as a key issue, and this is being addressed through co-finance and technical cooperation from the African Development Bank, FAO and other partners of the Lake Tanganyika Integrated Management Programme.	Mpulungu and Kaputa Districts of Zambia
Lukanga swamps	Zambia has Seven wetlands of international importance that include, the Kafue Flats (Lochnivar and Blue Lagoon National Parks) Bangweulu Swamps (Chikuni), Lukanga Swamps, Mweru-Wa-Ntipa Swamps, Lower Zambezi Floodplains, Luangwa Floodplains and Liuwa Flood Plains)	Parts of Central, Muchinga, Southern Provinces

Add row

Delete row

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.**

The National Biodiversity Strategic Action Plan (NBSAP) is an overarching framework in the provision of linkages and collaboration between sectors in the national programmes and policies governing conservation and sustainable use of biodiversity for food and agriculture. As a signatory to the Convention on Biological Diversity and other relevant international instruments, Zambia has undertaken to implement its resolutions. The results can be seen in the country's various policies for nature, heritage conservation, agriculture, environment, forestry, fishing, spatial planning, infrastructure, water management, social and economic activities and development cooperation.

The different policies in place governing conservation and sustainable use of biodiversity for food and agriculture include: Biotechnology and Biosafety policy of 2007; Wetlands policy still under development; National Agricultural Policy

There are also national strategies that have been developed to address components of biodiversity including: National Agricultural Implementation Plant (2013); Six National development Plan; National Vision 2030 to transform the country;

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

The Aichi Targets are being being implemented within the context of the NBSAP and within that there is a committee that provide technical guidance to achieving these targets. The ministries working together in an effort aimed at achieving Aichi Targets as they apply to the conservation and sustainable use of biodiversity for food and agriculture include among others the Ministry of Lands, Environment and Natural Resources, Ministry of Agriculture, Ministry of Fisheries and Livestock

Development, Ministry of Early Childhood, Science and Technology and Ministry of Energy and Water Development. Other supporting ministries are Ministry of Justice, Ministry of Finance and Ministry of Local Government and Housing.

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?**

The revised NBSAP (2015-2025) as part of measures to achieve Aichi Targets for the conservation of biodiversity for food and agriculture, the NBSAP of 1999 was revised to bring on board the aspirations to address the Aichi Targets as they may apply to the conservation and sustainable use of biodiversity for food and agriculture and planning implementation of national activities that have included the facets of these targets. The goals and targets of the revised NBSAP are based on 18 Aichi Targets to realign with national priorities.

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
Lake Tanganyika Management Integrated Programme	International (Zambia, Tanzania, Burundi, Congo DR)	Conservation of the diversity of fish species. The region has the highest diversity of the fish species in the region.	
Southern African Programme for conservation of plant genetic resources for food and agriculture	Regional (SADC)	Conservation and sustainable use of PGRFA	

Add row
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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?**

For extension programmes, farmer field schools targeting farmers in crop production practices.
(i) Training programme at undergraduate and postgraduate levels in Plant Breeding and Seed System
(ii) Natural resources management at the School of Natural Sciences at University of Zambia and Copperbelt University

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)	Enrolment (male)	Enrolment (female)
University of Zambia	School of Agricultural Sciences	Undergraduate	190		
University of Zambia	School of Agricultural Sciences	Post graduate	102		
Mulungushi University	School of Agricultura and Natural Resources	Undergraduate	130		
The Copperbelt University	School of Mathematics and Natural Resources	Undergraduate	170		

Add row
Delete row

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.

The universities include those operating through both public and privates arrangements. The main public universities are three which are:
(i) The University of Zambia, whose among other faculties include the Schools of Plant Sciences and Natural Sciences
(ii) The Mulungushi University has various schools including Centre for ICT Education, Agriculture & Natural Resources, Business Studies, Centre for Labor Studies, Disaster Management Training, Social Sciences, Distance Education and the Directorate of Research & Post-Graduate Studies.
(iii) Copperbelt University within which the faculties relevant to the conservation and sustainable use of biodiversity for food and agriculture include the school of Natural resources and the school of mathematics and natural sciences.

The university colleges include:
(i) The Natural Resources Development college in which thematic areas include crop sciences, animal sciences, soil sciences, nutrition and extension services.
(ii) The Zambia colleges of Agricultural sciences with specialization in soils, crops and animal sciences

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

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?**

The major gaps in information and knowledge 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 include unavailability of the functional national information hub as a clearing house for information related to biodiversity for food and agriculture.

The main capacity or resources limitation include (i) Inadequate human resources capacity (ii) There limited institution capacities, except for the public universities at individual level for teaching purposes. (iii) Financial resource limitation to build capacity such as laboratories for identification of the components

With regards to the main policy and institutional constraints lack of specific national policy support for conservation of the conservation and sustainable use of biodiversity for food and agriculture lenders these resources to be adequately attended at national level.

In terms of action required (i) strengthen the institutional and human resource capacity that will entail establishing new institutions and revision of curricula to accommodate conservation and sustainable use of biodiversity for food and agriculture at all levels of the national education system. (ii) There is a need for policy and strategies to support the conservation of biodiversity for food and agriculture.

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?**

The major gaps in information and knowledge with respect to stakeholder participation and ongoing activities that support maintenance of biodiversity for food and agriculture and collaboration between institutions and organizations is the lack of clear

information and knowledge sharing mechanisms among the various stakeholder institutions and organizations on the maintenance of biodiversity and ongoing initiatives and activities that support conservation of biodiversity.

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?**

With respect to capacity development, the major gaps in information and knowledge is the lack of relevant provisions within the education curricula on aspects relevant for conservation and sustainable use of biodiversity for food and agriculture at critical stages of human development. The actions and priorities that would be required to address this gap is the deliberate policy of entrenching issues of biodiversity in our education system from primary through to the tertiary levels.

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?**

The major gaps in information and knowledge with regard to knowledge generation and science for the management and sustainable use of biodiversity for food and agriculture measures should be in place to introduce the needed knowledge base at the nucleus stage which will entail deliberate movement to introduce management issues and sustainable use of biodiversity for agriculture early enough in the national educational system. The main policy and institutional constraints with respect to knowledge generation and science is lack of prioritization of and insufficient institutional support to the science of management and sustainable use of biodiversity for food and agriculture in the national development agenda. However, the major weakness lies in the implementation of the policies. As the nation, the action required and priorities include mainstreaming knowledge generation and science for the management and sustainable use of biodiversity for food and agriculture.

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 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.

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 In particular Targets 6, 7, 13. as well as to how they link to other related processes undertaken through the Convention on Biological Diversity.

Zambia has initiated a number of national plans, strategies and programmes through which activities related to the conservation and sustainable utilization of biodiversity for food and agriculture are to be undertaken at national, regional and local levels with involvement of communities. It is important to note that the national plans, strategies and programmes have a specific agenda of addressing specific sector activities for either directly or indirectly conservation and sustainable use of biodiversity for food and agriculture.

Strengthening the conservation and management of associated biodiversity and wild foods

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.**

The national future agenda for the conservation and sustainable use of biodiversity for food and agriculture lies in drawing up an action plan to halt the loss of biodiversity and to implement relevant national environmental goals and targets, including those that are of relevance to agriculture, forestry and fisheries. Most of these goals and targets are linked to the Strategic Plan for Biodiversity 2011-2020 (including the Aichi Biodiversity Targets) that provides the overarching framework on biodiversity for the entire United Nations system. The national plans, strategies and programmes for the conservation and sustainable use of biodiversity for food and agriculture should be nested within the broader framework of the National Biodiversity Strategy and Action Plan (NBSAP). It is thus imperative that the relevant national laws and regulations relevant for the agenda of conservation and sustainable use of biodiversity for food and agriculture should be in conformity with international commitments. In this regard, Zambia is urged to ratify the Nagoya Protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their utilization to the Convention on Biological Diversity, which entered into force on 12 October 2014. In turn, the country should work towards bringing the national legislation relevant to access and benefit-sharing of genetic resources in line with the Nagoya Protocol. The nation should increase and sustain its efforts in the area of raising public awareness on the importance of biodiversity for food and agriculture to food and nutrition security. National strengthening of the sustainable management of biodiversity for food and agriculture will require research and extensive monitoring, capacity building and awareness raising activities for which political commitment and provision of increased and sustained national resources for among other conservation and sustainable use activities, monitoring activities of ecosystems, populations and species of relevance to food and agriculture, as well as data on the linkages between them, need to be strengthened.

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

Zambia has reviewed the 1999 National Biodiversity Strategy and Action Plan (NBSAP) and developing a new strategy for the country that is encompassing all the components of biodiversity for food and agriculture. Zambia's second NBSAP will cover the period 2015-2025, and its vision is "By 2025, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy environment and delivering benefits essential for all Zambians and the Zambian economy.

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.**

Stakeholders from a broad array of perspectives deliberated on a number of human, environmental, as well as food security development issues in Zambia. Build effective local-level capacities to effectively participate in decision-making, benefit-sharing, and natural resource management. This may be done in public-private-NGO-community partnerships; review and strengthen the incentive structure for community-based natural resource management. This calls for a restructuring of the benefit sharing schemes; carry out comparative country studies on the impact of the CBNRM model, and effectiveness of participation by poor households in decision making process for the conservation of and sustainable use of biodiversity for food and agriculture.

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.**

The sustenance of conservation and use of biodiversity for food and agriculture anchors on the firm participation 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. The planned actions and future priorities for the conservation of biodiversity for food

and agriculture should therefore directly target these key players who are the custodians as well as users of the various components of biodiversity for food and agriculture. However, the traditional leadership in the local communities should be the important vehicle in this process as they catalyze the process and facilitate effective participation of the local people in their respective areas of domain.

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.**

The recognition of women in the conservation and use of different components of biodiversity for food and agriculture including associated biodiversity is key as the decision making process in these matters especially related to conservation of these resources at household level largely hinges with women. It is imperative that any planned actions and future priorities in that sense should systematically permit participation of women. In most cases, women play a key role in the maintenance of the biodiversity for food and agriculture. Dominance of male over women in that regard will jeopardize the planned actions for the conservation of biodiversity for food and agriculture.

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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	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)
	Subtropics	
	Temperate	
	Boreal and /or highlands[1]	
Livestock landless systems	Tropics	Systems in which livestock production is separated from the land where the feed given to the animals is produced.

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

	Subtropics	
	Temperate	
	Boreal and /or highlands	
Naturally regenerated forests	Tropics	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)
	Subtropics	
	Temperate	
	Boreal	
	Boreal and /or highlands	
Planted forests	Tropics	Includes : • semi-natural (planted component) : Forests of native species, established through planting or seeding, intensively managed • 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
	Subtropics	
	Temperate	
	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 water.
	Subtropics	
	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[56] • 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
	Subtropics	
	Temperate	
	Boreal and /or highlands	

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[2].

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 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

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

	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.