COUNTRY REPORTS

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

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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: Ethiopia

National Focal Point: Ethiopian Biodiversity Institute (EBI)

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?

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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:
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Commission on Genetic Resources for Food and Agriculture
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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.

The preparation of Ethiopia's first Country Report on the State of the World's Biodiversity for Food and Agriculture (SoWBFA) was initiated with invitation from Food and Agriculture Organization (FAO) of the United Nations. It was undertaken following the Guideline developed by FAO for the same purpose. The guideline suggests the preparation of the report to follow a template which has a total of 97 queries categorized into six chapters. Chapter one deals with introduction to the country and to the role of biodiversity for food and agriculture; Chapter 2 deals with drivers of change; Chapter 3 deals with the state and trends of biodiversity for food and agriculture; Chapter 4, deals with the state of use of biodiversity for food and agriculture, Chapter 5 deals with the state of interventions on conservation and use of biodiversity for food and agriculture; Chapter 6 future agendas for conservation and sustainable use of biodiversity for food and agriculture.

The first draft report was prepared by a group of experts representing different sectors (crop, animal, forest, microbial) and one cross-sectorial area (access and benefit sharing). Almost all experts, previously, have participated in the preparation of sectorial country reports or National Strategic action plan. Due to limitations with funding and time, despite the need for wide range of stakeholder involvement in providing information, the preparation of the first draft was mainly based on review of available information, and heavily draws upon sectorial country reports and National Biodiversity strategy and action plan. The first draft was later presented to a workshop in which representatives of various stakeholders have participated. A final daft was prepared after incorporating additional information and comments forwarded by the stakeholders.

Ethiopia is a country of great geographic diversity. Macro- and micro-climatic conditions of the country are highly variable. The rainfall distribution is seasonal and the mean annual rainfall ranges from 500 mm to 2800 mm. In addition the cultural diversity of the country is immense with more than 80 nations- nationalities existing in the country. There are ten ecosystems, 18 major and 49 minor agro-ecological zones that are inhabited by amazingly great diversity of animal, plant, and microbial genetic resources that make the country one of the biodiversity hotspots of the world. The country possesses an estimated number of 6000 species of higher plants of which 10% are endemic. There are 75 breeds of cattle, sheep, goat, and equines, five species of honey bees, 284 species of wild mammals, 861 species of birds, 201 species of reptiles, 200 species of fish, 63 species of amphibians and 1,225 species of arthropods. Of the wild faunal resources; 29 mammal, 18 bird, 10 reptile, 40 fish, 25 amphibian and seven arthropod species are endemic to the country. The country is also believed to harbour a wide diversity of microbial genetic resources. In Ethiopia, biodiversity plays vital and diverse roles in economic, ecological and social fabrics. Biodiversity and its ecosystem services are the bases for agriculture, where agriculture is the core driver of the country's growth and long-term food security.

In the process of preparation of this country report a total of seven tropical production systems were identified among those listed in the guideline. These include livestock grassland based, livestock landless, naturally regenerated forests, planted forests, self recruiting capture fisheries, irrigated crops (including rice), and mixed systems. Where available estimates of the

area coverage and contribution of the various production systems to the economy of the agricultural sector have been provided.

Assessment of major drivers of change which affect (positively or negatively) biodiversity for food and agriculture, associated biodiversity (those species of importance for ecosystem function) and wild foods have been made, The magnitude of effect of the various drivers of change on plant, animal, forest and aquatic genetic resources and ecosystem services have been indicated across the seven production systems. Despite lack of information in sizeable number of cases negative trends have been seen in most of the cases. However where intervening initiatives exist (e.g. integrated watershed management) positive changes have also been observed. Description of the effect of the major drivers of change for nine types of ecosystem services and on the components of associated biodiversity has also been given. The ecosystem services include pollination, pests and disease regulation, water purification and waste treatment, natural hazard regulation, nutrient cycling, soil formation and protection, water cycling, habitat provisioning, and production of oxygen/gas regulation. The effect on wild foods of drivers of change has also been given. There exists negative effect of the various drivers on availability and diversity of wild foods while, in most cases, the effect on knowledge about wild foods is not known.

The state and trends of biodiversity for food and agriculture, particularly forest, aquatic, animal and plant genetic resources have been included in this report. Negative trends are shown in all cases and a number of species form each component are known to be under varying levels of threat. Similarly state and trends in associated biodiversity and ecosystem services across the seven production systems have also been shown. Despite lack of information in most cases, trends in four components of associated biodiversity viz. microbial, vertebrate, invertebrate, and plants were shown to be negative in sizeable number of cases. Similar situation has also been shown for trend in the state of ecosystem services. Information on impact of change in biodiversity for food and agriculture on ecosystem serves and, on presence of any actively managed associated biodiversity species have been found to be lacking. Threats to honey bees and conservation measures being taken on microbial genetic resources as components of associated biodiversity have been indicted.

A number of wild food (wild edible plants) are found to be threatened where agricultural expansion and overgrazing are contributing as major threats. Currently there are in situ conservation programs for some of the wild food plants. Negative impacts of natural or human-made disasters on biodiversity for food and agriculture have been observed, while information was not available on its effect on ecosystem services. Additionally six invasive alien species have been identified and have been found to have negative effect on components of biodiversity for food and agriculture in a number of production systems.

Gaps and priorities with respect to status and trends of conservation of associated biodiversity and wild foods, and impact of natural and human-made disaster, and invasive alien species on biodiversity for food and agriculture have been identified. Over-use of chemical control mechanisms, inappropriate water management, activities leading to soil and water degradation, overgrazing, uncontrolled forest clearing and overharvesting are major practices which have negative impact on associated biodiversity and/or wild foods. The effect of lack of biodiversity for food and agriculture on production, food security and nutrition and livelihood has been shown to vary across production systems. Gaps and priorities with regard to use of biodiversity for food and agriculture have also been identified. Gaps include, inter alia, lack of assessment on state and trends of associated biodiversity and ecosystem services, and limitation in human resource skilled in the subject area, technology, methodology and finance. Addressing knowledge gap, awareness creation on importance, building institutional capacity and addressing policy issues have been identified as areas of action which need prior attention.

The state of interventions on conservation and use of biodiversity for food and agriculture and the provision of ecosystem services have been discussed along with national policies, programmers, information management, availability of capacity and resources, and knowledge generation and science with respect to management and sustainable use of biodiversity for food and agriculture. The sustainable land management project as a grand action implementing landscape based initiatives has been discussed along with its implication to protect biodiversity for food and agriculture. In addition to that policies, programs and enabling environments governing exchange, access and benefit sharing of associated biodiversity along with obstacles have been described. Information management, stakeholder involvement, collaboration between institutions and capacity building have also been discussed along with identification of gaps and priorities.

Planned actions and priorities with regard to biodiversity for food and agriculture, associated biodiversity and wild foods have been described. Improving stakeholder involvement, capacity building, addressing gender aspect, implementing ecosystem approaches are major prior areas.

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.

The first draft report was prepared by a technical committee representing different sectors (Animal, Crop, Forest and Microbial) and one cross-secotrial area (Access and Benefit Sharing). Almost all experts, previously have participated in the preparation of secortial country reports and/or National Biodiversity Strategy and Action Plan. The draft was presented on a workshop of large number of stakeholders and also soft and hard copies were provided to them. Comments and additional information provided during the workshop and thereafter were incorporated in the preparation of the final draft. Members of the technical committee included:

1. Dr. Alishum Ahmed - Forest and Rangeland plants Biodiversity Directorate, Ethiopian Biodiversity Institute
2. Mr. Anteneh Tamirat- Access and Benefit sharing Directorate, Ethiopian Biodiversity Institute
3. Dr. Eleni Shiferaw - Crop and Horticulture Biodiversity Directorate, Ethiopian Biodiversity Institute
4. Mr. Girum Faris - Microbial Biodiversity Directorate, Ethiopian Biodiversity Institute
5. Dr. Solomon Abegaz - Animal Biodiversity Directorate, Ethiopian Biodiversity Institute

Stakeholders participating in the process represented the following organizations:

- Ministry of Agriculture
- Ministry of Environment and Forestry
- Ministry Water, Irrigation and Energy
- Ministry of Trade
- Ministry of Industry
- Ministry of Education
- Ethiopian Institute of Agricultural Research
- Ethiopian Wildlife Conservation Authority
- Regional Agricultural Research Institutes
- Regional Bureaus of Agriculture
- Regional Livestock Agencies
- Biological Society of Ethiopia
- Regional Environment and Land use Bureaus
- Higher Learning Institutions
- NGOs (Ethiopian Wildlife and Natural History Society, ANCEDA - Arsi Nature Conservation and Environmental Development

Association)

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.

Ethiopia is located in the horn of Africa, bordering Eritrea in the North, Djibouti and Somalia in the East, Kenya in the South, Sudan and South Sudan in the West. The country stretches from 3oN of the equator to latitude 15oN and from 33oE to 48oE longitude, and has an area of 1,127,127km2. Ethiopia has wide altitudinal and physio-geographic variations. The altitudinal variation of the country ranges from 116 meters below sea level in the Danakil Depression to the highest peak of 4,620 meters above sea level (masl) on Mount Ras Dashen. The physiogeographic features are composed of high and rugged mountains, flat-topped plateaus, deep gorges, incised river valleys and rolling plains. The Great Rift Valley runs from Northeast to Southwest of the country and separates the Western and South eastern highlands. Extensive semi-arid lowlands in the East, South and West are extensions of these highlands.

Ethiopia has ten ecosystems, and 18 major and 49 minor agro-ecological zones. Macro and micro-climatic conditions of the country are highly variable. The rainfall distribution is seasonal. The major rainy season lasts from June to September followed by short rainy season that occurs between February and April. The mean annual rainfall ranges from 500 mm to 2800 mm. Similarly, mean annual temperatures range from below 10 to above 30oC. Ethiopia has 12 river basins. The total mean annual flow from all the 12 river basins is estimated to be 122 BMC. The country has 11 fresh and 9 saline lakes, 4 crater lakes and 12 major swamps or wet lands. Majority of the lakes are found in the Rift valley basin. The total surface area of these natural and artificial lakes in Ethiopia is about 7500 Km2. The majority of Ethiopian lakes are rich in fish (IWMI, 2007).

Ethiopia harbors a population of about 90 million (CSA, 2013), and about 83% of the people live in rural areas. Only 17% of the Ethiopians live in urban centers, of which nearly half of them live in Addis Ababa. Today, Ethiopia is the second most populous country in Africa, next to Nigeria. With an annual population growth rate of more than 2%, Ethiopia will have more than 120 million people by 2030 (MoA, 2011).

Agriculture is the main stay of the Ethiopian economy employing about 83% of the total population. It contributes about 45% to the GDP, 90% to the total export earnings and 70% of the raw materials to the agro-industrial sector. The per capita income of the country is USD 632 (MoFED, 2014). Despite the challenges of being one of the world's poorest countries, Ethiopia has good prospects for growth. Between 2005 and 2010, the country's real GDP grew by 11% per annum, with the service sector accounting for the highest growth of 15% and agriculture for more than 8%. A 15% expansion of agricultural land and a 40% yield increase accounted for the growth in the agricultural sector over the last five years. The International Monetary Fund forecasts for Ethiopia a real gross domestic product growth of more than 8% per annum over the next five years. Major export items include coffee, sesame, leather, flowers, old and live animals (MoA, 2011).

The country is endowed with diverse ecosystems that are inhabited by great diversity of animal, plant and microbial genetic resources, thus making the country one of the biodiversity hotspots of the world.

Crops have vital roles in agricultural production as a driver for economic growth and food security. Five major cereals (tef, wheat, maize, sorghum and barley) contribute 29% of agricultural GDP, 14% of the total GDP (ESSP II, 2011). Pulses contribute 9.3% of total grain production and have significant role in Ethiopia's economy generating an export earning of USD 129 million per annum (MoFED, 2010). Earnings from coffee contribute 4-5% of the GDP, about 20% of the government revenue and 60% of the total foreign exchange. Ethiopia is also one of the major producers of natural gums. In the year 2012/13, for example, the country earned USD 11.24 million from the export of gums and incense (MoT, 2013). Though the values of genetic diversity are widely recognized, monetary valuation has been made only for few of the resources. The economic value of the wild coffee genetic resources for the world coffee industry in breeding programmes for disease resistance, low caffeine contents and increased yields is estimated to lie in ranges between 0.5 and 1.5 million USD/year. Over a 30 year period of time this value would go up as high as USD 1.45 billion (Hein and Gatzweiler, 2006; Gatzweiler, et al., 2007).

Livestock serve as sources of commodities for export such as live animals, meat and meat products, hides and skins, and honey and bees wax to earn foreign exchange. About 80% of Ethiopian farmers use animal traction to plough their fields. According to MoFED (2009), the contribution of livestock to the GDP, excluding ploughing services is 25%. If the value of their

ploughing services is included, however, their contribution to the GDP will rise to up to 45% (IGAD, 2011), increasing the overall role of agriculture to the national GDP. In the last two decades, hides and skins provided on average 90% of official livestock sector exports, whereas live animals and meat provided 6% and 4%, respectively. At present, the total value of livestock and their products stands at about 20% of all national exports (IGAD, 2011; IBC 2012c). In 2008/09, household expenditure on livestock products was estimated at 1.086 billion USD, and the livestock sector exports helped to earn more than 240 million USD (MoT, 2013) excluding hide and skin. High populations of crocodiles are found in protected areas in most of their distribution ranges, in addition to Arbaminch Crocodile Ranch, and generate 1,605,000 USD per annum (Seyoum Mengistu et al., 2005). There is also one newly established private crocodile farm located near Lake Chamo. Many insects are of great use to human kind since they are the primary agents of pollination and in most communities they occupy intermediate positions along the food chain (IBC, 2005).

Forests contribute an estimated 4% to GDP through the production of honey, forest coffee, and timber. Recent estimates indicate that about 26-30% of the total coffee production of the country originates from wild and semi-managed coffee forests. The value of wild coffee is estimated at 130 million USD/annum (Mulugeta Lemenih, 2009). Ecosystem services provided by the forest biodiversity include provisioning, regulating, supporting and cultural services.

Although there is no quantified data on value of microbial genetic resources, there are evidences for their significant contribution in national economy. They play pivotal roles in preparation of traditional foods and local drinks both in the rural and urban areas of the country. With growth of agroindustries such as dairy, beverage, food and ethanol production, contribution of microbial genetic resources to national economy will be increasingly enormous. Furthermore, the value of microbes in the health sector such as vaccine development, pharmaceutics and quality control is increasing from time to time. Similarly, roles of microbes in biochemical processes that contribute to improved plant nutrient availability such as mineralization, phosphate solubilization, siderophores production, plant growth regulation and induced resistance have been reported for different farming systems, including Ethiopian Coffea arabica and traditional agro-forestry system (Diriba Muleta, 2007).

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.

Agriculture is the leading sector of the Ethiopian economy, and 83% of the population depends on agriculture. Hence biodiversity for food and agriculture has a big role in improving food security and nutrition, the livelihoods, ecosystem health and sustainability of production systems.

Crops have vital roles in agricultural production as a driver for economic growth and food security. Five major cereals (tef, wheat, maize, sorghum and barley) contribute to 64% of the calories consumed (ESSP II, 2011). Pulses contribute 9.3% of total grain production and are sources of income for small-holder farmers, as a higher-value crop than cereals and as a low-cost source of protein that accounts for approximately 15% of protein intake. Livestock also play important roles in providing food, household income, draught, farmyard manure and fuel, ecological and social functions. About 80% of Ethiopian farmers use animal traction to plough their fields. Livestock have economic functions serving as savings and assets which are insurances to mitigate risks. Beekeeping, which is mostly a traditional activity, engages one in 10 smallholders. National annual production of honey and beeswax is estimated at 40,700 and 4,200 tones, respectively (MoARD, 2007). Regarding the fish sector, the total annual catches of fish from lakes and reservoirs have production potentials of about 50,000 tonnes/year. However, only about 15,000 tonnes are being exploited (FAO, 2005). Many insects are of great use to human kind since they are the primary agents of pollination and in most communities they occupy intermediate positions along the food chain (IBC, 2005).

Forest resources of Ethiopia serve for economic, ecological and social purposes. Their biodiversity play vital and diverse roles to ensure food security, and sustainable livelihoods for millions of households throughout Ethiopia. Ecosystem services provided by the forest biodiversity include provisioning, regulating, supporting and cultural services. Non Timber Forest

Products (NTFPs) such as forages from forest largely serve as the feed sources of livestock in the country. Fodder driving from forests provides 10% and 60% of the livestock feed in the wet and dry season, respectively. Similarly, many edible wild plants have supplementary, seasonal and emergency roles for a significant number of rural populations.
In Benshangul Gumuz national regional state, for example, edible wild plants contribute 30 to 40% to food security in normal and at times of food shortage.

Microbes play pivotal roles in preparation of traditional foods and local drinks both in the rural and urban areas of the country. Traditional foods such as Injera, Kocho, Bulla and Cheese, and local drinks such as Tella, Tej, Borde, Cheka and Areke are the means of livelihood and sources of income for millions of rural and urban Ethiopians. In many part of the country, several species of mushroom are considered as delicious food, and currently small scale mushroom farming is spreading in urban areas. Although, there is no quantified data, they increase yield of associated pulse crops and available soil nitrogen for plants for the succeeding farming season. Similarly, roles of microbes in biochemical processes that contribute to improved plant nutrient availability such as mineralization, phosphate solubilization, siderophores production, plant growth regulation and induced resistance have been reported for different farming systems, including Ethiopian Coffea arabica and traditional agro-forestry system (Diriba Muleta, 2007).

In Ethiopia, over 75,000 accessions of plants have been conserved under ex situ conditions in cold storage and field gene banks so far. There are also 381 microbial species belonging to bacteria, fungi and microalgae have been conserved ex situ in national gene bank. There are 12 field gene banks established to conserve coffee, medicinal plants and forest species and six community seed banks. Ranches have also been established in different parts of the country for conservation and sustainable utilization of Begait, Borena, and Horro cattle breeds. Semen has been collected and cryo-conserved from Fogera, Begait, Sheko and Irob indigenous cattle breeds. In addition, construction of duplicate gene bank is underway at Fiche town to ensure the safety of ex situ collections (EBI, 2014a).
There are 13 insitu conservation sites for plants; eight additional in situ conservation sites are under establishment to conserve enset, durum wheat, tef, coffee, medicinal plants and forest plant species. In addition, six community gene banks, botanical gardens and bio-parks have been established in different parts of the country. Additional five on-farm conservation sites are being established in the SNNPRS. Three in situ sites have been established to conserve alkaline water ecosystems which contain unique micro-algal biodiversity at Lakes Chitu, Arenguade and Killole. In addition, three Lakes have been managed through ecosystem approach in Afar national regional state. Similarly, 13 in situ conservation sites have been established for cattle, sheep, goat and chicken breeds between (EBI, 2014a).

Indigenous crop varieties have been used in development of improved crop varieties which are being made available to farmers through extension systems rise. Improved agronomic practices such as row planting and increased use of inputs (fertilizers and herbicides) through aggressive extension system have contributed a lot to increased crop yield. Estimated cropped area and volume of production have increased by about 1.01% and 8.54%, respectively in one year (2012/13 to 2013/14) (CSA, 2014).

Significant risks or dangers to the conservation and use of biodiversity for food and agriculture include habitat conversation, unsustainable utilization, invasive species, climate change, pests and diseases, replacement of local varieties and breeds and pollution.

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	A1	Self-recruiting capture fisheries: Tropics	☒
Fisheries	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

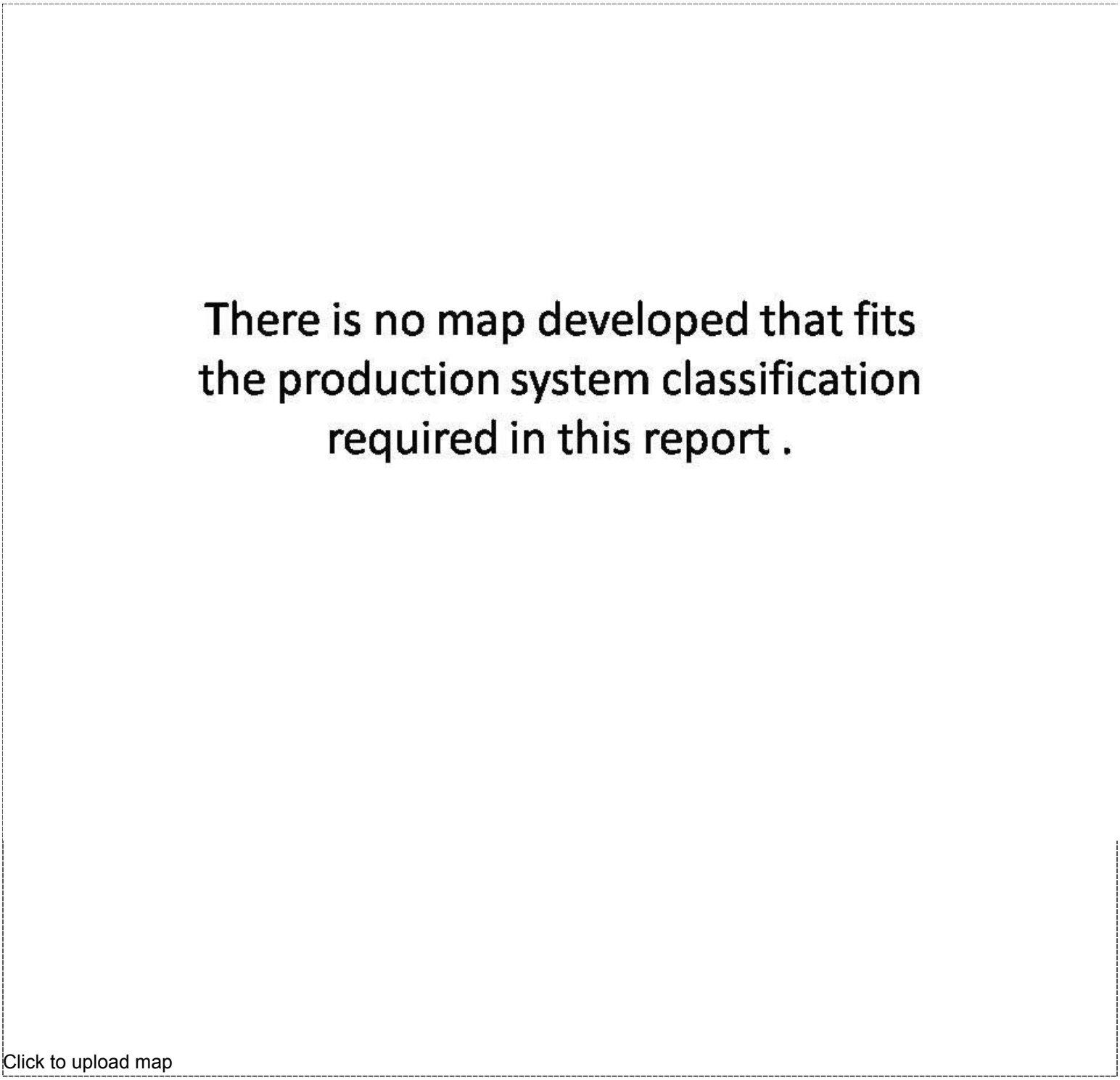
Production system	**Description**
Livestock grassland-based systems: Tropics	The production is mainly common in arid and semi-arid areas where the precipitation is not adequate for crop production. The landscape is characterized by flat to undulating terrain. It is characterized by pastoral and agro pastoral way of life dominantly practiced by small holders. So far, livestock (camel, cattle, sheep, and goats) are the major source of livelihood and income in this system. However, public owned large scale sugar plantations based on irrigation are being constructed in some areas in this production system and there is a possibility of change in livelihood (participate in out growers scheme, intensification of livestock, employment opportunity, and other livelihood options). The overwhelming majority of livestock for export comes from this system. The system is low input low output type with extensive type of production and totally based on indigenous livestock breeds. Pastoral areas cover about 60 percent of the land area and support about 10 percent of the population.
Livestock landless systems: Tropics	The system is dominantly found in urban and peri-urban areas. It is characterized by intensive, market oriented small to large scale dairy and poultry production with high dependence on purchased inputs and exotic genotypes and their crosses. The total urban population engaged in agriculture and agriculture related activities is estimated at 431,214 (CSA, 2014). It's likely that sizable proportion of these population is engaged in dairy and poultry production.
Naturally regenerated forests: Tropics	This production system is found in most ecosystems of the country (e.g. the dry and moist afro montane). The landscape is characterized by high mountains, hilly, undulating and flat terrain. With regard to the livelihood with in the production system, harvesting of medicinal plants, honey, construction, fire wood and charcoal, spices and condiments, etc.

Planted forests: Tropics	This production system is found across all the regions of the country showing progressive development since 2000. An area of 972000 hectares has been reported to be covered by planted forests (IBC, 2012a). There is an ongoing aggressive plantation programes (Ethiopian Millennium Plantation, Integrated Water Shed Development, Community forests and Agro forestry systems) and the size of plantation forests is showing significant increase. Moreover, about 2.9 million hectares of land have been afforested with different tree species. In years 2011 through 2013, for example, a total of 16.8 million seedlings of indigenous and exotic trees have been planted in various parts of the country (MoA, 2014a,b). Consequently, rehabilitation, restoration and afforestation schemes that have been implemented so far have made large contribution to enhance biodiversity and increase the forest cover of the country (EBI, 2014a). The system is contributing to the growth and development of apiculture and livestock production based on zero grazing. It is contributing to stability of microclimate and promotion of livelihood diversification and other rural income generating mechanisms.
Self-recruiting capture fisheries: Tropics	Ethiopia is a land-locked country which has approximately 7400 Km2 surface area of water body and 7185 Km long river network (Janko, 2014). Most of the water bodies are found in warm low land areas except few lakes in the highland. The inland capture fishery comprises rift valley lakes (Lake Chamo, Abaya and Ziway and Northern part of lake Turkana) and lake Tana, rivers and small water bodies. The total annual fish catch of Ethiopian water bodies is estimated at 15000 tons while the potential is around 51000 tons. Sizable proportion of the population around the water bodies is engaged in capture fishery business the activity contributes significantly to their livelihood. People consume large amount of fish in fasting days in big cities, around production areas and towns, especially, in Ziway, Arbaminch, Bahir Dar, and Addis Ababa. The domestic market for fish outside these areas is small. Significant proportions of followers of Orthodox Christianity in Ethiopia observe fasting against animal products, excepting fish, for nearly half of the year.
Irrigated crops (other) : Tropics	Most of Ethiopia's cultivated land is under rain fed agriculture. The total irrigated crop area in the country within the private peasant holdings was estimated to be more than 164 thousand hectares. The farmers who practice irrigation are estimated 1.1 million. Most of the area irrigated was under maize, sorghum, Teff and barely estimated to be about 49 thousand for maize, more than 17 thousand for sorghum, more than 12 thousand hectares for Teff , and about eight thousand hectares for barely (CSA, 2009). Regarding rice, its at national level has increased from 112,443 quintals in 2006/07 to 923627 quintals in 2013/14. During the same periods the area coverage has increased from 6241 hectares to 33,819 hectares. About 120 thousand small holder farmers are engaged in rice production. There are also limited large-scale commercial farms which are increasing in importance in recent times. A substantial number of rice producers in the country practice irrigated production system. Contribution of rice to the annual income of producers ranges from 37.84% to 61% (EIAR, 2013).
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	The mixed system of agriculture is practiced in all parts of Ethiopia except the pastoral areas. It is highly dependent on rain with limited irrigation in the dry seasons. In some areas agro-silvo pastoral system where crop, forest and livestock production are integrated, is being practiced. Except few emerging commercial farms almost all small holder farming activities (on which more than 70% of the population depend) fall under this system. Therefore, the livelihood in the majority of the rural communities is based on this system. The use of inputs and modern varieties in this system is increasing.

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

Add

Delete



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: Tropics	676276.2	KM2	23000000000	ETB	18	2008/09
Livestock landless systems: Tropics	NK	NK	NK	NK	NK	NK
Naturally regenerated forests: Tropics	12296000	Hectare	24000000	M3	9	2011
Planted forests: Tropics	2,900000	Hectare	NK	NK	NK	2014
Self-recruiting capture fisheries: Tropics	14,794	KM2	15,389	Ton	NK	1991, 2014
Irrigated crops (other) : Tropics	333,000	Hectare	NK	NK	NK	2014
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	13800000	Hectare	319000000	Quintal	NK	2014

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.

Ethiopia's export continued to be primary agricultural commodities. Agricultural products such as coffee, oilseeds, khat, leather and leather products, pulses, cut flower, fruits and vegetables and live animals constitute 70 % of Ethiopia's exports. Coffee continues to be the leading export item accounting for 24 % of total export values, followed by gold (19 %), oil seeds (14 %), Khat (9 %), pulses (8 %), flower (6 %) and live animals (5 %) (UNDP, 2014).

Ethiopia produced 22.5 million tonnes of crop, of which 95 percent is from small holder farms and the remainder from commercial farms. As a major source of calories, cereal production is critical to both household and national food security in Ethiopia. In 2010/11, over 96 percent of cereals were produced by smallholder farmers and 65 percent of this production was consumed within the farm-household and only 16 percent was sold for cash or bartered (UNDP, 2012). In 2010, 71% of the coffee, 41.72% of oil seeds, 11.126% of the pulse and 0.234% of the cereal (only maize) produced in the country were exported (CSA, 2010 and ERCA, 2011). For livestock, domestic consumption outweighs exports by a factor of nearly five to one. In 2008/09, household expenditure (Domestic consumption) on livestock products was estimated at 19 billion ETB (~1 Billion USD) while export livestock sector export was about 4 billion ETB (~ 0.21 billion USD) (IGAD, 2013). Major export items are meat, leather, hide and skins and live animals (cattle, sheep, goats, and camel). All export is generated from the traditional type of production. However, recent drastic increase in livestock export may become above the off take can support and results in decline of populations. Hence, may have a negative effect on the livestock biodiversity.

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.

Changes in land and water use and management
• Conversion of natural forests, grazing lands, woodlands, and wetlands into agriculture land and settlement are some of the threats to biodiversity of Ethiopia in almost all production systems.
• The extensive transformation of pastoral land to irrigated agriculture may have adverse effect on the livestock and vegetation diversity in the livestock grassland based system.
• Conversion of crop and degraded lands (agricultural lands) into forest and wood lands by which the ecosystem and diversity and distribution of genetic resources have been rehabilitated.

Pollution and external inputs
• Herbicide use is the first serious problem for the decline of bee colonies (Tura et al., 2014)
• Recent developments in increased food production and floriculture industry have resulted in higher consumption of chemical fertilizers and pesticide (Tadesse and Asiferachew, 2008; EBI, 2014b). Excessive drainage of nitrogen and phosphorus from agricultural fields to fresh water systems causes eutrophication which in turn will cause loss of species in that particular site (EBI, 2014b). Pollutions from industries due to inappropriate disposal of wastes to water bodies are a serious problem to the ecosystem and fish and other aquatic biodiversity (Tessema et al., 2012).

Over exploitation and over harvesting

• Unregulated and uncontrolled fishing, along with other factors such as erosion and water resource developments have threatened fish genetic resources in the country. Similarly, over harvesting threatens some timber tree species and medicinal

plants species (EBI, 2014b).
• Overgrazing/browsing by livestock in many ecosystems, including rangelands has also contributed to the degradation of rangelands and forest ecosystems and associated biodiversity (EBI, 2014b).

Climate Change

• Temperature and precipitation particularly the timing and extent of snow cover and frost formation have been identified as key drivers in afro alpine and sub afro alpine ecosystems.
• Ethiopia has been historically prone to extreme weather events since early 1970 the country has suffered seven major droughts, where rainfall is highly erratic (Diao and Pratt, 2007).
• Climate change also causes shortage of livestock feeds, disease outbreak, change in disease distribution and shrinkage of range lands and pest infestation. Furthermore, it causes desertification, forest fire, high evapo-transpiration and drought.

• With change in temperature and humidity an increase or decrease in available habitat of Tsetse could happen with subsequent increase or decrease of trypanosomiasis incidence and the livestock diversity.

• With change in climate there is a reduction in the length of growing period with consequences leading to decline in long season crop genotypes.

Natural disaster

• River flood, hailstorms and dry spells which had occurred in various parts of Ethiopia and has caused significant amount of damage on livestock and crop in the mixed system. The reported damage is likely to result in loss of sizeable amount of biodiversity, including associated biodiversity.

Pests, diseases, alien invasive species

• Some forests of Ethiopia such as the Borana wood land, which is known for gum and resin products, are deteriorating due to bush encroachment (Acacia drepananolobium, A. oerfota, A. mellifera). On the other hand, Prosopis julifora, which was introduced to the country for its multiple benefits such as land reclamation, has turned to be invasive in Afar and Somali Regional States and is reducing the overall biodiversity of the areas it invades by forming a thick monospecific scrub.
• Parthenium hysterophorus is spreading rapidly in many rangeland areas and farmlands of Afar, Somali, Oromia, Amhara and Gambella national regional states, causing enormous reduction in forage production. Yield losses due to Parthenium weed in sorghum reached 46-97%, depending on the location and year.
• Eichhornia crassipes is also becoming serious threat in the Awash River system (Wonji and Koka reservoir areas) and Lake Tana obstructing irrigation, affecting productivity and biodiversity of the aquatic ecosystems.
• Carmine cochineal (Dactylopius coccus costa), an insect that was introduced into the country in 2001 for production of cochineal dye (Tesfaye Belay and Zimmermann, 2006), reportedly causing heavy damage on cactus species (Opuntia ficus-indica) in northern Ethiopia.

Markets, trade and the private sector

• Increased demand for milk and poultry (egg and meat) has caused introduction of exotic animals at the expense of indigenous genotypes.

• With improvement in market and focus on market oriented production farmers tend to shift to few improved varieties and mono culture (e.g. Chat) type of production. This can have serious negative implication on crop and associated biodiversity.
Policies
• The energy policy of Ethiopia issued in May, 1994 include increasing energy utilization efficiency and reducing energy wastage and ensuring that development and utilization of energy is benign to the environment. However implementation of the policy is fraught because of lack of alternative livelihood and energy sources. As a result there is increase pressure on natural resource base and on associated biodiversity.

• Some sectorial and cross-sectorial policies relevant to biodiversity lack means to incentivize stakeholders. As a result implementation is not to the level demanded by the challenge.

• Policies related to agricultural development are wanting in terms of balancing increase in production with conservation of agro-biodiversity (EBI, 2014b).

Population growth and urbanization

• Ethiopia’s population has increased steadily over the last three decades, from 42.6 million in 1984 to 83.4 million in 2011 (CSA, 2011). The population increase causes expansion and intensification of land use, overutilization of biological resources

and exploitation of marginal lands, and the breakdown of traditional resource-management systems. As a result, it is putting undue pressures on all ecosystems and biodiversity of the country.

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.

• Climate change has caused adverse ecological, economic and social impacts in the country. One of the impacts is reduction in the length of growing seasons that has resulted in the loss of many long duration varieties as well as force large areas of marginal agriculture out of production (EBI, 2014b).

• In Afroalpine and subafroalpine ecosystems climate change has resulted change in vegetation, impacting the distribution of wild animals and associated biodiversity in these areas. One example is the possibility of reduction in home range of Gelada baboons (Theropithecus gelada) (EAS, Unpublished, Dunbar, 1998)

• A research study conducted in the UK, asserts that the survival of Arabica coffee is very dependent on the micro climate and local habitat. The study assess the survival of Arabica rather than productivity (yield of coffee beans) or beverage quality of Arabica are tightly linked to climatic variability, and are strongly influenced by natural climatic fluctuations. If the current climate change continues unabated, it is predicted that Arabica coffee will go into extinction till 2070 (Davis et al., 2012).

• With change in climate and its impacts on livelihood most households revert to natural resources such as forests and harvest wood and non-wood products for subsistence and to augment family income as a coping mechanism (EAS, unpublished). This can have significant effect on forest and associated biodiversity.

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: Tropics	Changes in land and water use and management	-1	-1	-2	-1
	Pollution and external inputs	NK	0	0	-1
	Over-exploitation and overharvesting	-1	-1	-2	-1
	Climate change	-2	-2	-2	-1
	Natural disasters	-2	-2	-2	-1
	Pests, diseases, alien invasive species	-2	-2	-2	-1
	Markets, trade and the private sector	-1	-1	-2	0
	Policies	1	1	-1	1

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

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

Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	Changes in land and water use and management	-1	-1	-1	NK
	Pollution and external inputs	-1	-1	-1	NK
	Over-exploitation and overharvesting	-1	-1	-1	NK
	Climate change	-1	-1	-1	NK
	Natural disasters	-1	-1	-1	NK
	Pests, diseases, alien invasive species	-2	-1	-1	NK
	Markets, trade and the private sector	-1	-1	-1	NK
	Policies	1	1	1	NK
	Population growth and urbanization	-1	-1	-1	NK
	Changing economic, socio-political, and cultural factors	-1	-1	-1	NK
	Advancements and innovations in science and technology	1	1	1	NK
	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: Tropics	Changes in land and water use and management	NK	-1	NK	2	0	1	1	1	-1
	Pollution and external inputs	NK	NK	-1	NA	-2	-1	NK	-2	-1
	Over-exploitation and overharvesting	-1	-1	-1	-1	-1	-1	-1	-2	-1
	Climate change	NK	-1	-1	-2	NK	-1	-1	-2	-1
	Natural disasters	-2	-1	-1	-2	-1	0	-1	-2	-1

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

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

	Changing economic, socio-political, and cultural factors	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Advancements and innovations in science and technology	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Other [*please specify*]:									
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	Changes in land and water use and management	-1	-1	-1	-1	-1	-1	NK	-1	NK
	Pollution and external inputs	-1	-1	-1	NK	-1	-1	NK	-1	NK
	Over-exploitation and overharvesting	NK	NK	-1	-1	NK	-1	-1	-1	NK
	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	-1	-1	-1	-1	-1	-1	NK
	Markets, trade and the private sector	-1	-1	-1	-1	-1	-1	-1	-1	NK
	Policies	NK	NK	NK	1	NK	1	1	NK	NK
	Population growth and urbanization	-1	-1	-1	-1	-1	-1	-1	-1	NK
	Changing economic, socio-political, and cultural factors	NK	-1	-1	NK	NK	NK	NK	-1	NK
	Advancements and innovations in science and technology	NK	1	NK	1	NK	1	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.

See in the attached document

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	-2	-1	-2
Pollution and external inputs	-1	NK	-1
Over-exploitation and overharvesting	-2	-1	-2
Climate change	-1	NK	-1

Drivers	Effect of drivers (2, 1, 0,-1, -2, NK, NA)		
Natural disasters	-1	NK	-1
Pests, diseases, alien invasive species	-1	NK	-1
Markets, trade and the private sector	-1	NK	-1
Policies	1	1	1
Population growth and urbanization	-1	-1	-1
Changing economic, socio-political, and cultural factors	-1	-1	-1
Advancements and innovations in science and technology	NK	1	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.

Changes in land and water use and management:

• In the last twenty years (between 1990 and 2010), the country had lost 18.6% of its forest cover or around 2,818,000 ha (FAO, FRA, 2010), and in addition, some 10,000 ha of wood-lands per year, because of change in land use and habitat alteration. In the highlands of Ethiopia, land use and land cover change has reduced the surface run-off and water-retention capacity and stream flow, leading to a loss of wetlands and the dying of lakes (Muluneh & Arnalds 2011; Addis, 2009; Asfaw, 2009). The conversion of forests & woodlands of the country into other land use types (agriculture, settlement, mining, infrastructure, etc) has significantly contributed to habitat loss and to the decline and degradation of biodiversity resources including wild foods & the associated traditional knowledge (Demel T, 2004). In addition, indigenous species have largely been replaced by a few fast growing exotic species, notably eucalyptus. The introduction & promotion of Eucalyptus & other exotic sp has resulted in the genetic erosion of indigenous plants including wild edible species. In general, because of changes in land and water use and their overall management, the availability and diversity of wild foods (bush meat, wild-edible plants, etc.) has significantly declined & degraded in the last 10 years. At the same time, the traditional knowledge on wild foods is negatively affected.

Pollution and external inputs:

• The rich biodiversity of the country is under serious threat from natural and human degradation factors. The major threats (overexploitation, overgrazing, expansion of cultivation, settlements, population pressure, etc) are accompanied by several driving forces that aggravate the changes and trends in the decline and loss of biodiversity resources at all levels. One of these drivers is pollution and use of external inputs. With the increase in the volume, magnitude and development of the industry sector, there is an increase in the variety and volume of use of pollutant materials and other external inputs that do impose a serious threat on the flora & fauna resources of wild foods. In addition, the increased use of pest and insecticides and other chemical materials in agricultural fields near by forests and woodlands is also degrading the diversity of wild foods. Despite the existing relevant policies and employment of environmental impact assessment (EIA) in different development sectors, serious degradation and genetic erosion is threatening much of the wild lands and their biodiversity including wild food resources of the country. Thus, the population, distribution and genetic diversity of wild foods are dramatically declining. Pollution to aquatic and terrestrial ecosystems in Ethiopia is mainly caused by large and small scale factories which have unregulated waste disposal. They are causing major damage to the nearby aquatic and terrestrial ecosystems through deposition of heavy metals & other pollutant materials, which in turn contributes to loss of biodiversity resources in general & wild food species in particular. In addition, chemical fertilizers, pest & insecticides and other pollutant materials used in the agriculture, industry, health, & other related sectors are aggravating the negative impact on wild foods. Despite lack of documented data & information on the effect of the driver on traditional knowledge of wild foods, the centuries old knowhow is being eroded through acculturation and the loss of plant biodiversity along with indigenous people and their cultural background (Asfaw, 2009). The cumulative impact of the driver on the availability & diversity of wild foods is negatively affecting the resource base.

Over-exploitation and overharvesting:

• Over-exploitation and overharvesting of forests for fuel wood, charcoal, construction material, wild food and other needs and overgrazing of pasturelands for decades, perhaps for centuries, have resulted in a loss of thousands of hectares of forest that harbor useful wild foods (Kelbessa et al., 1992; Addis, 2009; Asfaw, 2009; Teklehaymanot and Giday, 2010). This has

contributed to the decline & loss of biodiversity including wild foods, & this in turn has limited the benefits gained from the resources and the associated traditional knowledge (Teklehaymanot and Giday, 2010).
• So, in general, there is a very serious negative impact of the driver on the availability and diversity of wild foods, compared to the negative impact imposed on the associated traditional knowledge.

Climate change:

• Over the last decades, temperature in Ethiopia increased at about 0.2°C per decade. The increase in minimum temperatures is more pronounced with roughly 0.4°C per decade. Precipitation, on the other hand, remained fairly stable over the last 50 years when averaged over the country. However, the spatial and temporal variability of precipitation is high (Keller, 2009). Climate change has caused adverse ecological, economic and social impacts in the country. The change fundamentally alters the underlying agro-ecosystems through elevated temperatures and CO2 levels, leading to changes in pests and disease activity and population levels. Additionally, climactic variables influence the spread of vector-borne diseases through determining the distribution and growth rate of vectors and shortening the life cycle (Holly and David, 2001). Change in climate has also caused shortage of livestock feeds and wild foods, disease outbreak, change in disease distribution and shrinkage of rangelands. Furthermore, it causes desertification, forest fire, high evapo-transpiration, and drought. In some places, climate change favored bush encroachment such as Acacia drepanolobium to invade the rangelands, and there by affecting the diversity & availability of feed & wild food resources. Other effects of climate change include loss of traditional institutions and the associated knowledge/practices.

Natural disasters

• Natural disasters also do have the same impact on wild food resources of the country as that of climate change.

Pests, diseases, alien invasive species:

• Invasive species cause biodiversity loss by competing with native species for feed and habitat and altering the physical environment in ways that exclude native species. So far, close to 35 invasive weed species, including alien species, are identified in Ethiopia, and they are posing negative impacts on native biodiversity, agricultural lands, rangelands & national parks with huge economic as well as social consequences (Rezene Fessehaie et al., 2012). The major alien invasive species imposing a serious threat on the diversity and availability of wild foods are: These species are severely aggressing the habitat of the native species including wild foods and resulting in the decline and loss the overall diversity of the country. Other factors with adverse effect on wild foods are pest and disease infestations. The cumulative impact of all these factors has negatively affected the availability & diversity of wild foods, though their impact on the associated traditional knowledge is not known at the moment.

Markets, trade and the private sector:

• The introduction, promotion and development of market oriented & export commodities are increasing from time to time at times at the expense of the natural resources in general and the indigenous biodiversity resources of the country in particular. The private sector is the main actor in this regard. Several commercial farms and mining companies are established across the country by the private sector to produce market oriented & export commodities. Though the sector contributes to the national economy, it imposes significant threat on the diversity & availability of wild foods of the country.
• So, in general, changing markets, trade & the private sector impacts negatively both the availability & diversity of wild foods, though its impact on the associated traditional knowledge is not known currently.

Policies:

• Though there is no any specific policy that addresses wild foods, the conservation & utilization of their genetic resources is incorporated in the relevant policies that address the conservation & utilization of all the components of biodiversity resources in general. Despite the gaps and limitations in implementation, the relevant policies (Biodiversity and Research Policy, Environmental Policy, Forest Policy & strategy, etc,) as a driver of change, have a significant impact on the maintenance, conservation & sustainable utilization of wild foods. So, in general, the relevant policies are positively impacting the availability, diversity & the associated knowledge of wild foods.

Population growth and urbanization:

• As to the population statistics of the Central Statistical Agency (CSA), the present population of Ethiopia has reached to 83.4 million. It has increased steadily over the last three decades, and is expected to reach 130 million by 2020 (CSA and ICF International, 2011). Population growth is directly correlated with increase in resource consumption. Uncontrolled population growth puts undue pressures on all natural resources of the country. At present, the population increase coupled with urbanization causes expansion and intensification of land use, overutilization of biological resources and exploitation of

marginal lands, and the breakdown of traditional resource-management systems (Kelbessa et al., 1992; Addis, 2009; Asfaw, 2009; Teklehaymanot and Giday, 2010). As a result, it is putting undue pressures on all ecosystems and biodiversity of the country including wild food resources. The population pressure coupled with urbanization, have contributed to the depletion & deterioration of the availability and diversity and to loss of the associated traditional knowledge of wild food resources across the country.

Changing economic, socio-political, and cultural factors:

• The continuity of knowledge on the utilization of wild foods has faced problems because of change in the feeding culture of the people (Teklehaymanot and Giday, 2010). Besides, because of change in the economy & socio-political sector, market oriented & export commodity production (promotion of monoculture) is taking the natural habitats of biodiversity resources including wild foods. This has equally marginalized & degraded the resource base, and thereby, contributed to the decline in the availability, the degradation and genetic erosion of the species & the loss of the associated knowledge of wild foods.

Advancements and innovations in science and technology:

• There is lack of documented data & information on the influence and effects of the driving force on wild food resources; however, few research activities & innovations are in place to promote the advancement of traditional knowledge with regard to wild foods and the sustainable utilization of the resource base. So, in this regard, there is relatively a positive impact on the associated knowledge of wild foods, though the impact of the driver on the availability of wild foods is not known currently. In addition, it seems that there is no any effect of the driver on the diversity of wild foods at the moment.

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?

Policy and Changing economic, socio-political and cultural factors have had the most significant effects on the involvement of women in the maintenance and use of biodiversity for food and agriculture.

Policy

Women's participation in agriculture particularly in crop production in the country is estimated between 45 and 75 percent. However, they produce a third less per unit of land than male farmers due to gender specific barriers to input-use and access to agricultural extension services. Women and men do not have equal access to information since often it is men who participate in membership in rural organizations, trainings etc. Women fail to benefit from advancements in innovations in science and technology since they do not have direct access to the information and modern inputs. Though greater attention is given to ensure that agricultural policies and programs are gender sensitive and address barriers to women's equal participation and benefit in rural producer groups and cooperatives, it has not yet translated into policies and programs in the cooperative sub-sector that are effectively facilitating women's increased and meaningful participation in these formal groups (reviewed by Thomas Woldu et al., 2013). In addition, agricultural policies often focus on highly demanded food and export-oriented crops and give very little attention to food crops maintained by women which are used for domestic consumption and are essential for household food security. The introduction and production technology also often focus on big scale agricultural production; hence production technologies for home gardens, which are mostly controlled by women farmers, is lacking (Gebremedhin Teklehaimanot and Mulubrhan Haile, 2007). Such technologies could serve as a means of increasing income generation and livelihood change for rural women.

Changing economic, socio-political and cultural factors

In many regions of the country, women are known to play a great role in the production of food crops, maintenance of natural resources in their surroundings, saving and proper use of their income, and responsibility for domestic work within the farm households. They have the desire and the knowledge to improve the nutrition of their vulnerable members. However, gender biased traditions that ignore women's involvement in decision making have contributed to the existence of less empowered women within society and hence they fail to be successful due to lack of resources and lack of a voice in relevant community decisions. In Tigray region for example, among resource control issues, access to small amounts of land (e.g. garden plots), which serve critical functions in fulfilling community and household needs has remained an important component of household food security for women, particularly in low and middle income areas Gebremedehin Teklehaimanot and Mulubrehan Haile, 2007). Compared to men, women, have unequal access to, control over, and ownership of key productive assets such as land,

credit, information and services (reviewed by Thomas Woldu et al., 2013).

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

Over-exploitation and overharvesting

With over-exploitation and overharvesting of biodiversity resources, decline in resources is taking place. The loss of the resources is impacting the use and maintenance of associated traditional knowledge.

Climate change

Climate change is causing increase in temperature, reduction in overall precipitation, and frequent extreme events. The cumulative impact of these changes has resulted in significant negative effect on biodiversity for food and agriculture (e.g. loss of long season crop varieties, seasonal change and frequency in flowering and fruiting of plants). As a consequence, associated traditional knowledge has also been affected.

Natural disaster

Natural disasters such as prolonged draught, forest fire and flooding, in addition to their effect on biodiversity for food and agriculture, at times disrupt society's way of life (e.g. displacement). This causes loss of associated traditional knowledge.

Markets, trade and the private sector.

Market has both negative and positive effect on biodiversity for food and agriculture and associated traditional knowledge. Recent new trend in marketing (e.g. trade in wild edible and medicinal plants, demand for organic products) has positive impact on maintenance and use of biodiversity for food and agriculture, hence, maintenance and use of associated traditional knowledge.
Demand driven changes such as shift to market oriented crops is resulting in expansion of mono cropping which resulted in loss of agro biodiversity and associated traditional knowledge.

Policies

Presence of proclamation (Access to Genetic Resources and Community Knowledge, and Community Rights Proclamation No. 482/ 2006) and code of conduct (Code of Conduct to Access Genetic Resources and Community Knowledge and Benefit Sharing in Ethiopia) have contributed for the maintenance and use of traditional knowledge associated with biodiversity for food and agriculture.
Changing economic, socio-political, and cultural factors

The impact of change in economic (market oriented agriculture, increase industrialization), socio-political (change in levels of education), and cultural factors (change in way of life) negatively affects the biodiversity resources (decline in diversity, distribution and frequency), which results in the decline and erosion of the associated traditional knowledge.

Advancements and innovation in science and technology

Initiatives to document of biodiversity and associated traditional knowledge (documenting wild edible plants, medicinal plants) contribute to maintenance and use of biodiversity and associated traditional knowledge. The use of advanced science and technology to explain and identify processes in some traditional practices (e.g. identification of microorganisms involved in traditional fermentation) associated with biodiversity has contributed to maintenance and use of traditional knowledge.

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

Markets, trade and the private sector.

Demand of organic products as a result of market incentives is playing significant role in promotion of the role of biodiversity for food and agriculture in improving sustainability and food security through income generation.

Policies

There are several legislations and sectoral and cross sectoral policies that promote conservation and sustainable utilization of biodiversity. These include proclamations on re-establishment of Ethiopian Biodiversity Institute, Access to Genetic Resources and Community Knowledge, and Community Rights, Ethiopian Environmental Policy, the Conservation Strategy of Ethiopia, Biodiversity Conservation and Research policy, Forest Policy and Strategy and the Land Use policy. Despite shortcomings in implementation of the laws and policies, they have contributed to the maintenance and use of biodiversity for food and agriculture and, hence, to food security and sustainability

Changing economic, socio-political, and cultural factors

The mainstreaming of biodiversity at all levels of in the curricula of education sector has contributed to the awareness of conservation and sustainable utilization of biodiversity for food and agriculture, hence, to improvement of food security and sustainability.

Advancements and innovation in science and technology

Improvement of genetic resources contributes to their conservation and sustainable utilization. Advanced breeding techniques are helping in this regard and in improving the role of biodiversity for food and agriculture towards increased food security and sustainability.

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.

Counter measures to reduce adverse consequences of changes in land and water use and management include:
• Community participation on biodiversity conservation and sustainable utilization improved
• Soil and water conservation and practices of agro-forestry increased
• Participation of the public and private sectors on natural resource conservation increased
• Benefits accrued from the access of genetic resources fairly and equitably shared to the local communities
• Expanding renewable energy use
• Employing sustainable management of natural habitat (forests, wetlands, aquatic ecosystems, grazing and rangelands)
• Promotion of use of non-timber forest products
• Rehabilitation of degraded forest through enclosure, employment of participatory forest management and integrated watershed approach to conserve soil and water
• Carrying-out of environmental impact assessment on development activities
• Conserving threatened plant, animal and microbial species

Counter measures to reduce adverse consequences of pollution and external inputs include:
• Expanding renewable energy use
• Employing sustainable management of natural habitat (forests, wetlands, aquatic ecosystems, grazing and rangelands)
• Devising national aquaculture development strategy (2009)
• Carrying-out of environmental impact assessment on development activities

Counter measures to reduce adverse consequences of over-exploitation and overharvesting include:
• Community participation on biodiversity conservation and sustainable utilization improved
• Soil and water conservation and practices of agro-forestry increased
• Participation of the public and private sectors on natural resource conservation increased
• Benefits accrued from the access of genetic resources fairly and equitably shared to the local communities
• Expanding renewable energy use
• Employing sustainable management of natural habitat (forests, wetlands, aquatic ecosystems, grazing and rangelands)
• Promotion of use of non-timber forest products
• Rehabilitation of degraded forest through enclosure, employment of participatory forest management and integrated watershed approach to conserve soil and water
• Carrying-out of environmental impact assessment on development activities
• Conserving threatened plant, animal and microbial species

Counter measures to reduce adverse consequences of climate change include:
• Natural resource conservation integrated into different national strategies, development plans and reporting systems (poverty

reduction, food security, growth and transformation plan, Climate Resilient Green Economy Strategy)
• Expanding renewable energy use
• Employing sustainable management of natural habitat (forests, wetlands, aquatic ecosystems, grazing and rangelands)
• Rehabilitation of degraded forest through enclosure, employment of participatory forest management and integrated watershed approach to conserve soil and water
• Climate change issues mainstreamed into national development and poverty reduction plans and strategies

Counter measures to reduce adverse consequences of natural disasters include:
• Soil and water conservation and practices of agro-forestry increased
• Rehabilitation of degraded forest through enclosure, employment of participatory forest management and integrated watershed approach to conserve soil and water
• Climate change issues mainstreamed into national development and poverty reduction plans and strategies

Counter measures to reduce adverse consequences of pests, diseases, alien invasive species include:
• Participation of the public and private sectors on natural resource conservation increased
• Employing sustainable management of natural habitat (forests, wetlands, aquatic ecosystems, grazing and rangelands)
• Carrying-out of environmental impact assessment on development activities
• Assessing, controlling and eradicating invasive species

Counter measures to reduce adverse consequences of markets, trade and the private sector include
• Mainstreaming biodiversity into development and business sectors
• Employing sustainable management of natural habitat (forests, wetlands, aquatic ecosystems, grazing and rangelands)
• Carrying-out of environmental impact assessment on development activities

Counter measures to reduce adverse consequences of population growth and urbanization include:
• Expanding renewable energy use
Counter measures to reduce adverse consequences of changing economic, socio-political, and cultural factors include
• Community participation on biodiversity conservation and sustainable utilization improved
• Mainstreaming biodiversity into development and business sectors
• Promotion of use of non-timber forest products
• Carrying-out of environmental impact assessment on development activities

Counter measures to reduce adverse consequences of olicies include
• Natural resource conservation integrated into different national strategies, development plans and reporting systems (poverty reduction, food security, growth and transformation plan, Climate Resilient Green Economy Strategy)
• Climate change issues mainstreamed into national development and poverty reduction plans and strategies
• Devising national aquaculture development strategy (2009)
• ratifying Nagoya protocol for ABS and developing ABS Code of Conduct

Measures to improve the contribution of Advancements and innovations in science and technology to improve to address the drivers:
• Reviewing the existing knowledge and innovations, functioning, status and trends, and the consequences of biodiversity loss, creating knowledge and technologies related to biodiversity, its values, functioning, status and trends, and the consequences of biodiversity loss.

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.

Crops Despite the fact that the majority of the arable lands in Ethiopia are cropped with farmers' varieties, there is a decreasing trend in the number of local varieties maintained by farmers. For example, farmer varieties of wheat, barley (Tigray BoA, unpublished; EOSA, 2007) and sorghum (Shewayrga et al., 2008) have been reported to disappear from in some parts of the country.

The factors affecting the state of field crop genetic resources are displacement of local varieties by improved varieties, shift to market oriented crop production, disease and pests, frequent drought and unreliable rainfall. The later affects not only landraces but also improved varieties.

The natural populations of many species of crop wild relatives are increasingly at risk. They are threatened primarily by habitat loss, degradation and fragmentation.

In order to maintain field crops diversity of Ethiopia, Ethiopian Biodiversity Institute (EBI, formerly IBC) has conserved different field crops in cold room. The overwhelming majority of plant species conserved in the gene bank are field crops. To assist on-farm conservation activities, over 12 community seed banks have been established, out of which six are in good status. Recently, additional five on-farm conservation sites are being established in the SNNPRS.

Horticultural Crops
bio
Horticultural plant species such as coffee (C. arabica), spices and enset (E. ventricosum) are being threatened by population pressure, drought, pests, disease, replacement by food grains and deforestation. Imported varieties of horticultural crops are also becoming threats to local ones.
Ethiopian Biodiversity Institute (EBI) has established field gene banks in different agro-ecological zones of the country as part of the ex situ conservation programme to conserve horticultural crops. Over 6,000 accessions of coffee, spices, and root and tuber crops are being conserved in these field gene banks.

Forest

A total of 103 tree and shrub species are considered as endangered species in the IUCN red list. In addition, some forest species such as Boswellia papyrifera and Oxytenanthera abyssinica (lowland bamboo) are also threatened (IBC, 2012a).

Forest resources of Ethiopia are seriously threatened by deforestation, habitat destruction and subsequent decline in regeneration, expansion of exotic and invasive (alien and indigenous) species, agricultural expansion and settlement, forest fires, illegal logging, firewood collection, and livestock grazing are threats to forests in all areas of the country.

EBI has conserved a total of 468 accessions of 93 forest species at its gene bank. Forest genetic resources are also being conserved in Protected Areas (PAs), National Forest Priority Areas (NFPA), and other in situ conservation sites such as area closures, church forests, sacred forests, community forests and biosphere reserves. However, due to inappropriate management, the status of some PAs, including the NFPAs is deteriorating.

Medicinal Plants

Majority of the medicinal plants utilized in Ethiopia are harvested from the wild. Therefore, most of the threats to the forest are also threats to medicinal plants. Additionally, uprooting and unsustainable utilization are major threats to medicinal plants. Medicinal plants such as Taverniera abyssinica, Hagenia abyssinica and Prunus africana are under various levels of threat. Ex situ conservation of medicinal plants are carried out by EBI at various sites.

Forage plants

Pasture and forage plants in both mixed crop-livestock and pastoral production areas are under threats. The major causes are overgrazing and browsing, drought, invasive species and conversion of pasture lands to crop lands. For instance, Prosopis juliflora and Parthenium hysterophorus are serious threats to palatable range plants in pastoral areas.

Wild Edible Plants

A recent review documented 413 species of WEPs representing 224 genera and 77 families. Shrubs represented 31% of WEP species followed by trees (30%), herbs (29%) and 9% by climbers (Ermias Lulekal et al., 2011). The contribution of WEP for food security is ignored and their ecosystems and corresponding local knowledge to sustain these resources is neglected. Factors that threaten forest resources are also the threats to WEPs and their natural ecosystems, resulting in a decrease in the diversity of WEPs from time to time.

Domestic animals

There are 28 indigenous cattle, 9 sheep, 8 goats, 6 donkeys, 7 camels, 8 horses and more than 7 chicken breeds/populations in the country. Despite increase in population of livestock in the country, most of the breeds/populations are showing decline. For instance, Sheko cattle, the only taurine breed in East Africa, appears to be highly threatened as a result of interbreeding with

the local zebu breed and a change in the production system.

In Ethiopia, major causes of threat to the farm animal genetic resources include feed shortage resulting from degradation of rangelands/grazing areas and resettlement of refugees in pastoral areas, overgrazing and overstocking; invasion of exotic weeds and shrubs; expansion of crop cultivation practices into both grazing lands in the highlands and marginal areas in the lowlands. Additionally, increased export above the level that can be supported by the off take rate also threatens livestock diversity particularly in pastoral areas.

There are about 5 sub species (Amsalu, 2004) and about 7 million colonies of honey bee in Ethiopia. Despite the significant contribution of apiculture, there are various threats to the honey bees. The main threat to honeybees emanate from diseases, pests, predators, and pesticide and herbicides (IBC; 2004, 2005, 2012d)

Wild animals

So far, 284 mammalian, 861 avian and 201 reptiles, 200 fish, 1225 arthropods and 63 amphibians have been characterized in the country. Of these faunal resources, 29 mammal, 18 bird, 10 reptile, 40 fish, 25 amphibians and seven arthropods (most of them butterfly) pecies are endemic to the country (IBC, 2009; USAID/Africa 2008; Redeat Habteselassie, 2012). According to the International Union for the Conservation of Nature's (IUCN, 2007) "red list", Ethiopia has six critically endangered, 23 endangered, and 70 vulnerable species of wild animals. For instance, of the total of 284 mammalian species, Walia Ibex (Capra walie), Gelada Baboon (Theropithecus gelada), Mountain Nyala (Tragelaphus buxtoni), Ethiopian Wolf (Canis Simensis) and Starck's Hare (Lepuss tarcki) are highly threatened and are targets of urgent conservation action.

Major threats to aquatic and terrestrial wild animals are habitat degradation, change in land use, overharvesting, unbalanced water utilization, siltation, mining, and pollution (EBI, 2014b).

Microorganisms

There are no estimates on the number of species of microbes identified so far in Ethiopia. Moreover, there is no exact data on the level of threats to microbial genetic resources of the country. However, all factors affecting ecosystem, plant and animal biodiversity are believed to affect directly or indirectly the microbial genetic resource base of the country. Therefore, collecting, identifying, conserving and knowing the status of microbial genetic resources of the country will clearly be a forthcoming major task.

All sectors of biodiversity are characterized by a wide range of variation at all levels of biodiversity. The common feature of these diversities is almost all are exposed to some level of threat and sizable numbers of the threats are common to all sectors. There is wide gap in the level of knowledge with regard to various sectors of biodiversity. In relative terms, there is significant information on domesticated plants and animals and forests and wood lands genetic resources, while there is a dearth of information with regard to microbial, invertebrate and aquatic genetic resources. The level of conservation and use among different sectors also varies and it is also related to the level of knowledge with regard to the genetic resources.
In almost all cases, there exists synergy among all sectors of biodiversity. As a result, conservation and sustainable use in one sector benefits the other(s).

In some pastoral areas which are close to protected areas, usually, there is conflict because of the desire by pastoralists to use the protected area for grazing their animals. Despite the benefit the pastoral livestock get from better pasture in the protected area than outside, the wild animals would suffer from the competition for food (Yirmed and Kahsay, 2011), disturbance, and possible disease transmission form the domestic to the wild animals (or vice versa).

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: Tropics	NK	NK	-1	-1
Livestock landless systems: Tropics	NK	NA	NA	NA
Naturally regenerated forests: Tropics	NK	NK	-1	-1
Planted forests: Tropics	1	NK	NK	NK
Self-recruiting capture fisheries: Tropics	-1	NK	-1	-1
Irrigated crops (other) : Tropics	NK	-1	NK	-1
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	-1	-1	-1	-1

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 most of the areas where the livestock grassland based systems are common there is overgrazing and overexploitation of the vegetation, as a result there is significant loss of plant diversity. In addition to that diversity in vertebrates has also been affected (e.g. the bird Liben lark, Heteromirafra sidamoensis), (Bird Life International, 2014). The livestock landless system is confined and the role of associated biodiversity is minimal or non-applicable to the system. Despite policies and legislations to protect the naturally regenerated forests in most cases implementation is fraught with problem. As a result there is significant loss in plant and vertebrate associated biodiversity. In the planted forest production system a number of trees which symbiotic-ally fix nitrogen are available and there is increased associated biodiversity in terms of microorganisms. Due to presence of a number of drivers (e.g. pollution, climate change etc.) associated biodiversity of micro-organisms, vertebrates and plants in self-recruiting capture fisheries system has been negatively affected. In both irrigated crops (including rice) and mixed production systems the use of chemicals and external inputs have significant negative effect on associated biodiversity particularly on invertebrates and plants. In mixed system vertebrates are also highly affected.

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: Tropics	NK	NK	-1	-1	-1	-1	-1	-1	-1
Livestock landless systems: Tropics	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naturally regenerated forests: Tropics	-1	NK	-1	-1	-1	-1	-1	-1	-1
Planted forests: Tropics	NK	1	1	1	1	1	1	1	1
Self-recruiting capture fisheries: Tropics	NA	NK	-1	NK	-1	NK	-1	-1	-1
Irrigated crops (other) : Tropics	-1	NK	-1	NK	NK	NK	-1	NK	NK
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	-1	NK	-1	-1	NK	NK	NK	NK	NK

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.

See in the attached document

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: Tropics	Changes in animal genetic resources	NA	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in crop genetic resources	NK	-1	-1	-1	-1	-1	-1	-1	-1

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

	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	1	NK	NK	NK
Self-recruiting capture fisheries: Tropics	Changes in animal genetic resources	NA	NK	NK	NA	NK	NA	NA	NK	NK
	Changes in crop genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in forest genetic resources	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in aquatic genetic resources	NA	NK	NK	NA	NA	NA	NA	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NK	NK	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	NA	NK	NA	NA	NA	NA	NA
	Changes in plants genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
Irrigated crops (other) : Tropics	Changes in animal genetic resources	NA	NA	NK	NK	NA	NA	NA	NK	NK
	Changes in crop genetic resources	NK	NA	NK	NK	NA	NK	NK	NK	NK
	Changes in forest genetic resources	-1	NA	NK	-1	NA	NA	NA	NA	NA
	Changes in aquatic genetic resources	NA	NA	NK	NK	NA	NK	NK	NA	NA
	Changes in micro-organism genetic resources (associated biodiversity)	NA	NA	NK	NK	NA	NA	NK	NA	NA
	Changes in invertebrates genetic resources (associated biodiversity)	-1	NA	NK	NK	NA	NA	NK	NA	NA
	Changes in vertebrates genetic resources (associated biodiversity)	NA	NA	NK	NK	NA	NA	NK	NA	NA
	Changes in plants genetic resources (associated biodiversity)	-1	NA	NK	NK	NA	NA	1	NK	NA
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	Changes in animal genetic resources	NA	-1	NK	NK	NK	NK	NK	NK	NA
	Changes in crop genetic resources	-1	-1	-1	-1	-1	-1	-1	-1	NK
	Changes in forest genetic resources	NK	-1	-1	-1	-1	-1	-1	-1	NK
	Changes in aquatic genetic resources	NA	NK	NK	NK	NK	NA	NK	NK	NK
	Changes in micro-organism genetic resources (associated biodiversity)	NK	NK	NK	NK	NK	NK	NK	NK	NK
	Changes in invertebrates genetic resources (associated biodiversity)	-1	NK	NA	NA	NA	NK	NA	NK	NK
	Changes in vertebrates genetic resources (associated biodiversity)	NK	NK	NA	NA	NA	NA	NA	NK	NA
	Changes in plants genetic resources (associated biodiversity)	NK	-1	-1	-1	-1	-1	NK	-1	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.

Livestock grassland based system

In livestock grassland based system, information on the impacts on ecosystem services due to the change in animal genetic resources and associated biodiversity of invertebrate, vertebrate, microorganisms and plant genetic resource is not known. Changes in crop genetic resources have a negative impact on crop and forest genetic resources. Diversity in crop genetic resources is decreasing from time to time and many landraces such as sorghum and durum wheat are reported to be either marginalized or lost (Shewayrga et al., 2008; EOSA, 2007). The decrease in diversity will minimize many of the ecosystem service provided by a diverse agricultural system such as controlling pest and diseases, regulation of natural hazards and habitat provisioning. The same is true with the change in the natural forest species in livestock grassland based system. They are affected by overutilization, bush encroachment and invasive species which minimize their diversity and the ecosystem services they provide.

Livestock landless system

Livestock landless system is dominantly found in urban and peri-urban areas and is characterized by intensive, market oriented small to large scale dairy and poultry production. Since this usually is carried out in a secluded area without direct contact with the ecosystem, the majority of the changes in genetic resources including associated biodiversity may not be directly applicable to this system. Most of this system is characterized by the use of improved breeds which might be less effective in natural disease and pest regulation (reference).

Naturally regenerated forest system

The naturally regenerated forest system in Ethiopia is affected by multiple pressures which include agricultural expansion, overutilization, invasive species, and climate change. This affects the forest the associated plant genetic resource (EBI/NBSAP, 2014). The decline in forest genetic resources negatively affects ecosystem services provided by the forest. Changes in associated biodiversity in naturally regenerated forests is not documented hence it is not possible to describe their impact on the overall system. Crop genetic resources refer to resources in the forest which are the result of agricultural expansion which changes a diverse forest area in to cropland. This phenomenon results in change of the ecosystem service provided by the forest. Aquatic genetic resources within the forest are influenced by various anthropogenic activities such as pollution and over exploitation. Hence the resource is diminishing in amount and diversity. This results in declining of ecosystem services such as water purification and waste treatment, and habitat provisioning.

Planted forest production system

Positive impact has occurred in the planted forest production system. During the last five years, about 2.9 million hectares of land has been afforested with different tree species (EBI, 2014a). This has a positive impact on ecosystem provisions in areas where afforestation has taken place. However, no studies are conducted on on changes in associated biodiversity and their impact on the ecosystem services.

Self-recruiting capture fisheries system

In Ethiopia, considerable proportion of the population around water bodies is engaged in capture fishery business. There are reports that indicate the decrease in number of some species due to overfishing. For example, commercial catches of large barbs in Lake Tana have resulted in sharp decline of the species due to over fishing in river mouths during fish migration to their spawning rivers, and other factors such as habitat degradation at the breeding ground of fish (rivers, tributaries and wetlands) (Dereje Tewabe and Goraw Goshu, 2010). Pesticides with toxic effect to fish are also being used in farms as close as two meters to the lake which is also harmful biodiversity of the lake (Mathewos Hailu et al., 2010). Such pressures create an imbalance in the biodiversity components of the water body. However, concrete information on the impact of changes in aquatic genetic resources and associated biodiversity on the various relevant ecosystem services is lacking.

Irrigated crops

Irrigation land expansion at the expense of forest areas and associated plant biodiversity negatively affects ecosystem services such as pollination and natural hazard regulation which results due to a decline in forest biodiversity. Decline in forest genetic resources also results in a decline in invertebrate genetic resources which used to inhabit in the forest. The main sources of irrigation in Ethiopia are rivers and lakes. Over exploitation of the water resource results in affecting ecosystem services such as habitat provisioning and water cycling.

Mixed production system

Acreage expansion is recorded as the more important source of growth in output for four of the major cereals between 2005 and 2008 (Alemayehu Seyoum et al., 2011). In the period between 2001 and 2009 cropland has increased at a ratio of 0.7 ha of deforestation for 1 ha of cropland (MoFE D /CRGE, 2011). Hence an increase in crop production has a negative impact in almost all of the ecosystem services since its increase has taken place at the expense of forest land and associated biodiversity of plant genetic resources. Data on changes in associated biodiversity of microorganisms, vertebrates and invertebrates is not

available hence it is not possible to determine the impact of their change on the different ecosystem services.

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	Information not available	Information not available	Information not available	Information not available
Pest and disease regulation	Information not available	Information not available	Information not available	Information not available
Water purification and waste treatment	Information not available	Information not available	Information not available	Information not available
Natural hazard regulation	Information not available	Information not available	Information not available	Information not available
Nutrient cycling	Information not available	Information not available	Information not available	Information not available
Soil formation and protection	Information not available	Information not available	Information not available	Information not available
Water cycling	Information not available	Information not available	Information not available	Information not available
Habitat provisioning	Information not available	Information not available	Information not available	Information not available
Production of oxygen/ Gas regulation	Information not available	Information not available	Information not available	Information not available
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.

Despite lack of information on actively managed associated biodiversity there are few cases where indirect monitoring is being implemented. These include annual inventory of bee hives (bee colonies), periodic forest inventory activities for monitoring the diversity, distribution, frequency and the regeneration status, and inventory of avian genetic resources at national level.

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
Honey bee	NE	Pesticides, shortage of bee forage	Kerealem et al., 2009, Admasu et al., 2008, Tadesse & Asferachew, 2008 and Samnegard et al., 2014

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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
Micro-organisms	Rhizobia, Acetic Acid Bacteria, Lactic Acid Bacteria, Mushrooms, Mycorrhiza, Yeast	381 species	Short and Long term cryopreservation	Conservation	Characterized at Species and Sub-species level

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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

Components of associated biodiversity	Organisms, species and sub-species (where available) conserved	Site name and location	Production system(s) involved (code or name)	Conservation objective(s)	Specific actions that secure associated biodiversity or ecosystem services
Micro-organisms	Spirulina (Arthrospira fusiformis)	Lake Chitu, Oromiya Region (Latitude: 7° 24'20.39" Longitude: 38° 25'34.57"), Lake Arenguade and Lake Killole, Bishoftu	Self-recruiting capture fisheries: Tropics	To conserve micro algal diversity in alkaline water ecosystem for future utilization.	Construction of physical and biological conservation structures around the lakes harbouring the microorganisms and reduction of human interference through community participatory action.

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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.

Data and information on maintenance of traditional knowledge of associated biodiversity is not available. However, the practice of rotating crops from cereals to legumes which is a traditional practice to maintain soil fertility is being encouraged by the extension system.

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.

Data and information on gender dimensions with respect to the maintenance of and knowledge about associated biodiversity is not available.

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
See in the attached document					

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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
Acacia negrii	VU	Agricultural expansion, Overgrazing	Vivero et al., 2005
Acanthus sennii	NT	Agricultural expansion, Overgrazing, Deforestation	Vivero et al., 2005
Barleria longissima	CR	Grazing, Invasive species, Human encroachment (Charcoal production), Climate change	Vivero et al., 2005, Flora of Ethiopia and Eritrea, Vol. 5, 2006
Dombeya longibracteolota	VU	Agricultural expansion, Overgrazing	Vivero et al., 2005
Phyllanthus limmuensis	VU	Agricultural expansion, Settlement, Over exploitation	IVivero et al., 2005
Rubus aethiopicus	EN	Agricultural expansion	Vivero et al., 2005

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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 edible plants in the country in general and those identified to be under threat in particular have significant importance in supplementing staple foods and filling food gaps. As a result, their loss causes food insecurity and imbalance. Additionally

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
Acacia abyssinica	13		Conservation and Research	
Acacia albida	2		Conservation and Research	

Wild food species conserved (scientific name)	Size of collection (number of accessions and quantities)	Conservation conditions	Objective(s)	Characterization and evaluation status
Acacia etbaica	5		Conservation and Research	Not done
Acacia hockii	2		Conservation and Research	Not done
Acacia polycantha	11		Conservation and Research	Not done
Acacia senegal	6		Conservation and Research	Not done
Acacia seyal	9		Conservation and Research	Not done
Acacia sieberiana var. woodii	4		Conservation and Research	Not done
Acacia tortilis	9		Conservation and Research	Not done
Albizia grandibracteata	1		Conservation and Research	Not done
Carissa spinarum L.	1		Conservation and Research	Not done
Celtis africana	1		Conservation and Research	Not done
Cordia africana	45		Conservation and Research	Not done
Ficus ovata	-		Conservation and Research	Not done
Ficus sur	-		Conservation and Research	Not done
Ficus sycomorus	1		Conservation and Research	Not done
Ficus vasta	-		Conservation and Research	Not done
Gardenia ternifolia	-		Conservation and Research	Not done
Grewia ferruginea	1		Conservation and Research	Not done
Grewia villosa	1		Conservation and Research	Not done
Luffa cylinderica	-		Conservation and Research	Not done
Moringa stenopetala	47		Conservation and Research	Not done
Myrsine africana	1		Conservation and Research	Not done
Olea europaea subsp. cuspidata	6		Conservation and Research	Not done
Oxytenanthera abyssinica	20		Conservation and Research	Not done
Phoenix reclinata	5		Conservation and Research	Not done
Phytolaca dodecandra	172		Conservation and Research	Not done

Wild food species conserved (scientific name)	Size of collection (number of accessions and quantities)	Conservation conditions	Objective(s)	Characterization and evaluation status
Piliostigma thonningii	-		Conservation and Research	Not done
Podocarpus falcatus	2		Conservation and Research	Not done
Prunus africana	1		Conservation and Research	Not done
Rumex abyssinicus	3		Conservation and Research	Not done
Rumex nervosus	1		Conservation and Research	Not done
Solanum americanum	-		Conservation and Research	Not done
Solanum memphiticum	-		Conservation and Research	Not done
Sterculia africana	3		Conservation and Research	Not done
Tamarindus indica	12		Conservation and Research	Not done
Vitex doniana	-		Conservation and Research	Not done
Ziziphus mucronata	1		Conservation and Research	Not done
Ziziphus spina-christi	-		Conservation and Research	Not done

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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
Arundinaria alpina	Masha, SNNPR	65 hectare	Species germ plasm conservation	Awareness raising activities conducted, Site demarcated and fenced
Ficus ovata	Bishan Gari	85 hectare	Species germ plasm conservation	Awareness raising activities conducted, Site demarcated
Oxytenanthera abyssinica	Mandura	15 hectare	Species germ plasm conservation	Awareness raising activities conducted, Site demarcated
Podocarpus falcatus	Bishan Gari and Sigmo Setema	125 hectare	Species germ plasm conservation	Awareness raising activities conducted, Site demarcated

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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 have been a number of studies to document the WEP genetic resources, associated traditional knowledge, the status they are in and on conservation efforts being made. Limited information on mushroom resources has also been generated and communicated. This information contributes to the maintenance of the traditional knowledge of WEPs and mushrooms. Studies have indicated that young children are involved in collection and use of WEP and this implies that there is a possibility for the traditional knowledge to be passed to the young generation. However, only about 5% of the country's areas have been covered by the WEP studies and ethnomycological studies on mushroom are meagre. Therefore, there is strong need for further and wide ranging studies. Almost all the information from studies hitherto are published and are accessible to stakeholders.

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.

Women and young children are mainly involved in collection of wild food (WEPs and mushroom) while women are, in most cases, the one to prepare the wild food (possibly have the traditional knowledge of preparation) for family consumption. Marketing of WEPs is usually done by young children and in sizeable number of cases the involvement of men is lower than that of women and children.

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)
River flood in SNNPR and Dire Dawa Administrative Region	Livestock grass land based systems: Tropics	-1	NK
River flood in SNNPR, Amhara and Oromia Regional states and Dire Dawa Administrative Region	Mixed systems: Tropics	-1	NK
Hail Storm in SNNPR and Tigray Regional states	Mixed systems: Tropics	-1	NK
Dry Spell in Tigray Region	Mixed systems: Tropics	-1	NK
River flood in Somali Region	Irrigated crops (Other): Tropics	-1	NK
Forest fire in different regions	Naturally regenerated forests: Tropics; Planted forests: Tropics	-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.

In 2006 river flood has occurred in various parts of Ethiopia and has caused significant amount of damage. In Southern Nations Nationalities and Peoples Region (SNNPR) over-flooding of Omo river has caused loss of about 3200 heads of livestock of pastoralists. The loss has occurred in areas which are known for having adapted type of livestock. Hail storm or similar type of flooding in other zones of the same region where mixed production system is common, has caused crop damage on land areas ranging from 100 to 5066 ha. Under the mixed system in Ethiopia, despite the aggressive extension program to promote use of improved crop varieties, farmers either because of choice or inadequate availability of improved seeds, are still likely to plant indigenous crops and the damage is not only loss of crop yield but the diversity therein. In the same year in Tigray occurrence of hailstorms or dry spell in various zones of the region, where mixed system is practiced, have caused crop damage on land area ranging from 100 to 1200 ha. The Tigray region is known for its diverse agro-ecology and wealth of crop diversity, and the reported crop damage is likely to result in loss of sizeable amount of biodiversity that contributes for food and agriculture. Similar crop losses from river flooding have been recorded in the same year in mixed systems of Dire Dawa administrative, Amhara and Oromia regions, and on irrigated crops of Somali region. Livestock loss has also been recorded in livestock grassland based systems of Dire Dawa Administrative region (DPPC, 2006). In all cases there is no information on the damage the various disasters have caused on ecosystem services. Forest fires of significant magnitude occurred in the various parts of the country in different years in the past decade. Both naturally regenerated and planted forests are subject to the damage. There have been significant losses in overall biodiversity for food and agriculture and on ecosystem services (FfE, 2009).

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.**

Natural disasters in various parts of the country have caused significant loss of livestock, crops and forests. For instance, flood in some areas of SNNPR has caused loss of 3200 heads of livestock and damaged about 6000 ha of crops. Annually forest fire causes damage to significant amount of forest vegetation. These have impacted livelihood, food security and nutrition.

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 many areas of the country where drought causes famine, enhanced use of biodiversity for food and agriculture, for instance, increased use of wild edible plants and use of early maturing crop varieties are among the coping mechanisms.

In some parts southern Ethiopia, increased use of wild edible trees happens during famine. About 12 species which are not otherwise consumed during normal periods would be consumed during famine or chronic food shortage, and the consumption of wild food plants ranks second as a coping mechanism for surviving during famine (Asegid & Tesfaye, 2011).

Use of short season crop varieties has been used in cases where climate variability or any other type of disaster affects (shortens) the crop growing season (DPPC, 2006).

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)
Prosopis juliflora	Livestock grassland based systems: Tropics; Naturally regenerated forests: Tropics; Mixed systems: Tropics; Irrigated crops (other): Tropics	-2	NK

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)
Parthenium hysterophorus	Mixed systems: Tropics; Livestock grassland based systems: Tropics; Irrigated crops (other): Tropics	-2	NK
Eichhornia crassipes	Self recruiting capture fisheries: Tropics; Irrigated crops (other): Tropics	-1	NK
Lantana camara	Livestock grassland based systems: Tropics	-1	NK
Dactylopius coccus costa	Naturally regenerated forests: Tropics	-1	NK
Cryptostigma grandifolia	Naturally regenerated forests: Tropics; Livestock grassland based systems: Tropics	-1	NK

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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.

Invasive alien species in Ethiopia

Recently, it has become clear that some alien species are having very negative impacts in Ethiopia. Several alien species are spreading at alarming rate, threatening agricultural lands, rangelands, national parks, waterways, lakes, rivers, power dams, roadsides, settlement and urban green spaces, and causing huge economic and ecological losses (Hailu et al., 2004, Kassahun et al. 2004, Senayit et al., 2004, Taye et al., 2004c, Taye et al., 2004d.). Among the recorded Invasive alien species in Ethiopia, the major ones imposing severe threat are mesquites (Prosopis juliflora), Parthenium weed (Parthenium hysterophorus), water hyacinth (Eichhornia crassipes), Lantana camara, Dactylopius coccus costa and Cryptostigma grandifolia. In general, almost all ecosystems are affected by these species, which pose one of the biggest threats to the biodiversity of the country. Though there is no documented data and information, the invasive alien species are negatively impacting ecosystem services through their severe threat imposed on biodiversity resources. The Biodiversity Conservation & Research Policy, the Forest Policy and Strategy, the Environment Policy of Ethiopia, the Forest Resource Strategy and the National Biodiversity Strategy and Action Plan, recognize invasive plant species to be growing threats to the biodiversity of the country and socio-economic welfare of the people (Anagae et al., 2004).

Prosopis juliflora

Prosopis juliflora was intentionally and wrongly introduced as an agro-forestry species in the 1970's by Ministry of Agriculture to high quality pasturelands and irrigable areas, including the Awash River basin in the Afar National Regional State (ANRS) of Northeast Ethiopia (HDRA, 2005a). Local people were not informed about the invasive nature of the tree at first and were not advised on management practices to minimize its spread (Dubale, 2006). As a result, the plant rapidly and aggressively invaded vast areas of agro- and silvo-pastoral lands, destroying natural pasture, displacing native trees, forming impenetrable thickets, and reducing grazing potential throughout its distribution range within the country and resulting in serious economic, environmental and social losses (Anderson, 2005). Though the invasion of the species is extended to several regions of the country, its impact on the ecology and biodiversity resources is more severe in the Afar Region (the invasion exists in four of the five zones and 11 of the 29 Woredas (administrative divisions) of the Region). For instance, over 700,000 (this figure seems to have increased since then) hectares of prime grazing land and cultivable land following the Awash River is either invaded or at risk of invasion from prosopis in the Region (US FS, 2006). This accounts for 15% of the region's productive land (4,670,316 hectares), excluding wetlands, water bodies, sandy and rocky areas (4,856,251 hectares) (Pastoral Agriculture Rural Development Bureau (personal comm. 2008)). The prosopis invasion has resulted in multiple negative effects on food security and livelihoods of the rural community and on the region's environment (Dubale, 2006). There is an increasing trend in incidence of crop pests and damage to eyes and hooves of both domestic and wild animals eventually leading to death of the

affected animals and reduction in the overall biodiversity of the areas.

The invasion of prosopis has caused considerable declines in livestock production and productivity due to the loss of dry season grazing areas to prosopis plants. Palatable indigenous pasture species such as Chrysopogon plumulosus, Cenchrus ciliaris and Setaria acromelaena have all reduced. Indigenous trees such as Acacia tortilis, Acacia senegal and Acacia nilotica have also declined in the rangelands due to the invasion. Pods and branches of these trees are the main dry season feed sources for livestock. Zelalem (2007) reported that camel ownership has reduced almost by one-third over the last five years alone while the mean number of calves and heifers was reduced by five fold. He also noted a higher rate of decrease in numbers of sheep and goats compared to camels, perhaps due to the relative advantage of camel to browse tall woody plants. Though in varying degrees, the impact of prosopis invasion across its distribution range is following the same trend within the country. In general, because of the increasing severe threat of invasion by prosopis within the identified production systems (Livestock grassland based systems: Tropics; Naturally regenerated forests: Tropics; Mixed systems: Tropics; and irrigated crops (other): Tropics), the components of biodiversity for food and agriculture are severely impacted through significant decline and loss in extent and diversity. There is lack of documented data and information to comment on the effects of prosopis on ecosystem services.

Parthenium hysterophorus

Parthenium entered the country during the Ethio-Somali war in 1976/77 through military vehicles (Frew et al., 1996). First noticed in 1980s near food-aid distribution centers in Ethiopia (GISP, 2004). Around Dire-Dawa, in1980's (Medehin, 1992; Frew et al., 1996; Tamado, 2001), P.hysterophorus has been threatening the natural and agricultural ecosystems. The weed is spreading rapidly across the country (in many rangeland areas and farm lands of Afar, Somali, Oromia, Amhara and Gambella national regional states), causing up to 90% reduction in forage production in some places. The extent of distribution of the weed is being more widespread than previously recorded (Mcconnachie et al. 2010).
In Hataye, Shewa Robit, Ambo, and Nazareth area, P. hysterophorus has been reported to enter crop fields (Taye Tessema, 2002). Besides the serious impact of partinium on the ecology and biodiversity resources of the country, all the upper mentioned trends indicate the weed's ability of presenting significant constraint on sustainable development, economic growth, poverty alleviation and food security (GISP, 2004). In addition, manual control of Parthenium weed by farmers resulted in developing skin allergies, itching, fever, and asthma in some of the farmers (Rezene Fessehaie, et al. 2012; IBC, 2012d).The social cost of parthenium in Ethiopia was measured by Disability Adjusted Life Years and its equivalence in terms of monetary value was estimated at 2,535,887 - 4,365,057 USD (Rezene Fessehaie, et al. 2012; IBC, 2012d). Based on the upper mentioned data and information, there is a significant decline and loss of components of biodiversity for food and agriculture within the specified production systems (Mixed systems: Tropics; Livestock grassland based systems: Tropics and irrigated crops (other): Tropics), because of the increased severe threat from the extensive and intensive aggression of partinium for the last 10 years in the country. But, because of lack of data and information, its impact on ecosystem services is not known currently.

Eichhornia crassipes

Water hyacinth is most serious in the Abay watershed and the Awash River system, with pronounced impacts on ecosystem functions and human activities. The species is blocking water ways for irrigation, navigation, electricity generation, fishing and livestock watering and increases water loss also. The species is imposing a serious threat especially in Wonji and Koka reservoir areas of the Awash River system and Lake Tana, obstructing irrigation, affecting productivity and biodiversity of the infested aquatic ecosystems. Impact assessment conducted at Wonji Shewa Sugar Estate, showed that, water hyacinth infested areas of 116.4 ha of irrigation water reservoirs, secondary and tertiary irrigation water supplies, border and central drains. The result indicated that the weed inflicted excess water loss that is estimated in ranges from 393,660 to 2,945,160 m3, restricting water flow and incurring significant management cost (Rezene Fessehaie et al., 2012).

Lantana camara

Lantana has usually been deliberately introduced into various localities in Ethiopia (particularly urban settings) as an ornamental shrub, and has been quickly spreading by birds and animals that eat its fruits but cannot digest the woody seeds. There are also indications that seeds of Lantana are water borne as young plants of this species are observed to escape from drainage ditches in the outskirts of Debre Zeit, Nazret, Harer and Dire Dawa. Hot spot areas of Lantana are reported to be in eastern Harerge and neighbouring localities of the Somali region forming impenetrable thickets in waste areas, abandoned cultivation, grasslands, and pastures. In the problem areas Lantana quickly takes over valuable grazing lands and its dense growth suppresses grasses and other useful forages. Though, there is lack of documented data and information on the extent and range of its distribution and impact on ecosystem services, the species is posing serious threat on the components of biodiversity for food & agriculture.

Dactylopius coccus costa

Dactylopius coccus costa is an insect that was introduced into the country in 2001 for production of cochineal dye (Tesfaye

Belay and Zimmermann, 2006). The insect is reportedly causing heavy damage on cactus species (Opuntia ficus-indica) in northern Ethiopia. Though not much is known about the impact of this invasive insect on ecosystem services currently, it is causing some losses on the genetic diversity of cactus species (Opuntia ficus-indica).

Cryptostigma grandifolia

Cryptostigma grandifolia is invasive weed species causing severe damage by reducing crop and forage yields, displacing indigenous species, and favouring the spread of crop pests (Rezene Fessehaie et al., 2012). So this invasive species is causing some loses in the diversity of indigenous crop & forage species of the country. Its impact on ecosystem services is not known currently.

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.

There is no information with regard to the contribution of biodiversity for food and agriculture in managing the spread and proliferation or controlling the established invasive alien species in the country.

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.

• Main similarities between associated biodiversity, wild food diversity and the different sectors;

The main similarities between associated biodiversity, wild food diversity and the different sectors lie in the common factors of drivers of change that affect them in a similar way. For example commercialization and intensification of agriculture have similar negative effect on the associated biodiversity, wild food diversity and the diversity in the crop, animal, forest and microbial sectors. The loss of pollinators in one way or the other affects the diversity in plants (both crop and forest). Almost all wild foods (both plant and animal origin) originate from forest or rangeland areas. With loss of the forest and the rangelands, the associated biodiversity within these ecosystems, and organisms which serve as wild food source would also be affected negatively. One additional point of similarity between wild food and associated biodiversity is the low attention given to their conservation and sustainable utilization.

• Major differences between associated biodiversity, wild food diversity and the different sectors;

Except intrinsic differences, there are no major differences between associated biodiversity, wild food diversity and the different sectors. The intrinsic differences lie in the nature of diversity, the various ways of conservation that need to be applied in each case (e.g. ecosystem approach or production system management), and the degree of anthropogenic involvement. The different sectors of biodiversity are being given due attention as opposed to wild foods and associated biodiversity.

• Synergies or trade-offs between associated biodiversity, wild food diversity and the different sectors.

There exists synergy between associated biodiversity, wild food diversity and the different sectors. Policies which are conducive to conservation and sustainable use of associated biodiversity (e.g. conservation policy, environmental policy etc.) also favor

wild food diversity. This synergy also works for diversity in the forest sector. Some trade-offs may exist between the animal sector and associated biodiversity. Area closure is an important means to bring regeneration of vegetation and restore the diversity. Under such condition domestic animals are prohibited from using the land for grazing. This may lead the animal genetic resources to be affected because of adequate feeding. The reverse situation of maintaining excessive number of animals on range or other lands can lead to overexploitation of the vegetation resources and cause damage to the associated biodiversity and wild food diversity. A case in hand is the use of a protected area under Awash Park for grazing animals by pastoralists in the surrounding area. This is causing significant damage to the wild life in the park through reduction of vegetation available in the area (Yirmed and Kahsay, 2011) disease transmission, and human wildlife conflict. Similar situation happens in Netch-Sar Park.

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?

• There is lack of assessment on state and trends of associated biodiversity and ecosystem services. They were not main targets of research because of focus mainly on the provisioning aspect of biodiversity and neglect to associated biodiversity and ecosystem services, emanating from lack of adequate awareness.
• Limitation in human resource skilled in the subject area, technology, methodology and finance hampers research and development in this area.
• Policies pertaining to natural resources are present. However, in addition to shortcomings with respect to implementation, they are focused on the biodiversity per se and do not directly address the associated biodiversity. Similarly, despite the presence of institutions working on biodiversity, their main focus is mainly on the provisioning aspect of biodiversity for food and agriculture.
• In adequacy in knowledge related to associated biodiversity and ecosystem services need to be rectified through research in these areas. In addition to that, awareness creation on importance of associated biodiversity and ecosystem services, building institutional capacity and addressing policy issues appear to be priorities in this regard.

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?

• The state of knowledge with regard to wild edible plants can be rated as inadequate. Only about 5% of the country's areas have been covered by the WEP studies. However, the situation with regard to knowledge on edible mushrooms and wild food of animal origin is worse. Therefore, there is strong need for further and wide ranging studies on state, trend, conservation and associate traditional knowledge pertaining to the resources.
• Except lack of financial resources and inadequacy in focus and awareness, there are no significant limitations with regard to capacity and resources.
• Despite incorporating issues of conservation of wild food resources in the sectoral policies addressing biodiversity in general, there are no specific policies directly targeting these resources. There is similar situation in terms of institutional arrangements.
• There is need for policies to specifically address wild food resources, given their contribution to food security in vulnerable areas. Inadequacy in knowledge related to wild food resources need to be rectified through research in these areas. In addition to that, awareness creation on importance of wild food resources should be given prior attention.

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?

• Despite the presence of information on magnitude of losses associated with natural and human made disasters, they lack information on the effect of disasters on biodiversity. For example, crop and livestock losses reported by Disaster Prevention and Preparedness Commission during various disasters provide information only losses based on crop area coverage and number of livestock.

• There is significant progress in terms of early warning system. However, there is still need to further strengthen and fine-tune the system to improve accuracy of predictions. In addition, there appears to be limitation in terms of providing disaster related information disaggregated into biodiversity for food and agriculture.
• Policies pertaining to the management of natural and human made disaster are present. However, the policies appear to lack focus in dealing with and utilization of biodiversity in disaster management.
• Improving the early warning system through strengthening human resource capacity, technology and methodology need to be addressed. In addition, the human resource capacity should be looked from the point of view of providing disaster related information disaggregated in terms of biodiversity for food and agriculture.

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?

• There is lack of adequate information on impact, distribution, biology and control methods of invasive alien species, particularly, as related to biodiversity for food and agriculture, associated biodiversity and ecosystem services.

• Human and financial resources are limiting the capacity to control invasive alien species.
• Despite incorporating issues of controlling invasive alien species in the sectoral policies addressing biodiversity in general, there are no specific policies directly targeting these species. There is similar situation in terms of institutional arrangements.

• There is need to generate additional information on impact, distribution, biology and control methods of invasive alien species. In addition to that, building capacity in control of these species and addressing relevant policy and institutional aspect appear to be priorities in this regard.

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

	Ecosystem approach to capture fisheries	NK	NK	NK
	Conservation hatcheries	NK	NK	NK
	Reduced-impact logging	NA	NA	NA
	Other [*please specify*]:			
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	Integrated Plant Nutrient Management (IPNM)	NK	NK	NK
	Integrated Pest Management (IPM)	NK	NK	NK
	Pollination management	NK	NK	NK
	Landscape management	NK	NK	NK
	Sustainable soil management practices	NK	NK	NK
	Conservation agriculture	NK	NK	NK
	Water management practices, water harvesting	NK	NK	NK
	Agroforestry	NK	NK	NK
	Organic agriculture	NK	NK	NK
	Low external input agriculture	NK	NK	NK
	Home gardens	NK	NK	NK
	Areas designated by virtue of production features and approaches	NK	NK	NK
	Ecosystem approach to capture fisheries	NK	NK	NK
	Conservation hatcheries	NK	NK	NK
	Reduced-impact logging	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.

Though different management practices are implemented in different production systems, there is no information on area coverage for each type of management practice with in a production system. Similarly, there is no information on the rate of change and the effect of management practices on biodiversity for food and agriculture. In some cases, the type of management practice is not applicable to the production system. Indicators are also lacking and there is huge gap in this regard.

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: Tropics	Diversification	NK	NK	NK
	Base broadening	NK	NK	NK
	Domestication	NK	NK	NK
	Maintenance or conservation of landcape complexity	NK	NK	NK
	Restoration practices	NK	NK	NK
	Management of microorganisms	NK	NK	NK
	Polyculture/Aquaponics	NA	NA	NA
	Swidden and shifting cultivation agriculture	NK	NK	NK
	Enriched forests	NK	NK	NK
	Other [*please specify*]:			
Livestock landless systems: Tropics	Diversification	NK	NK	NK
	Base broadening	NK	NK	NK
	Domestication	NK	NK	NK
	Maintenance or conservation of landcape complexity	NA	NA	NA
	Restoration practices	NA	NA	NA
	Management of microorganisms	NK	NK	NK
	Polyculture/Aquaponics	NK	NK	NK
	Swidden and shifting cultivation agriculture	NA	NA	NA
	Enriched forests	NA	NA	NA
	Other [*please specify*]:			
Naturally regenerated forests: Tropics	Diversification	NK	NK	-1

	Base broadening	NA	NA	NA
	Domestication	NA	NA	NA
	Maintenance or conservation of landcape complexity	NK	NK	1
	Restoration practices	NK	NK	NK
	Management of microorganisms	NK	NK	NK
	Polyculture/Aquaponics	NA	NA	NA
	Swidden and shifting cultivation agriculture	NA	NA	NA
	Enriched forests	NK	NK	NK
	Other [*please specify*]:			
Planted forests: Tropics	Diversification	NK	NK	NK
	Base broadening	NA	NA	NA
	Domestication	NK	NK	NK
	Maintenance or conservation of landcape complexity	NK	NK	1
	Restoration practices	NK	NK	NK
	Management of microorganisms	NK	NK	NK
	Polyculture/Aquaponics	NA	NA	NA
	Swidden and shifting cultivation agriculture	NA	NA	NA
	Enriched forests	NK	NK	NK
	Other [*please specify*]:			
Self-recruiting capture fisheries: Tropics	Diversification	NK	NK	NK
	Base broadening	NK	NK	NK
	Domestication	NK	NK	NK
	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) : Tropics	Diversification	NK	NK	NK
	Base broadening	NK	NK	NK
	Domestication	NK	NK	NK
	Maintenance or conservation of landcape complexity	NK	NK	NK

	Restoration practices	NA	NA	NA
	Management of microorganisms	NA	NA	NA
	Polyculture/Aquaponics	NA	NA	NA
	Swidden and shifting cultivation agriculture	NK	NK	NK
	Enriched forests	NK	NK	NK
	Other [*please specify*]:			
Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	Diversification	NK	NK	NK
	Base broadening	NK	NK	NK
	Domestication	NK	NK	NK
	Maintenance or conservation of landcape complexity	NK	NK	NK
	Restoration practices	NK	NK	NK
	Management of microorganisms	NK	NK	NK
	Polyculture/Aquaponics	NK	NK	NK
	Swidden and shifting cultivation agriculture	NK	NK	NK
	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.

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.**

Programs and institutions that run management and diversity based practices.
Integrated Pest Management (IPM)
• Desert Locust Control Program
• Ministry of Agriculture
• EIAR and RRI
• Universities

Pollination management
• Ministry of Agriculture
• Holeta National Bee Research Center
• ICPIE

Landscape management
• Sustainable Land use Management Project
• Sustainable soil management practices
• Sustainable Land use Management Project
• Ministry of Environment and Forestry.

Conservation agriculture
• Mainstreaming Agrobiodiversity into agricultural production systems of Ethiopia
• ASARECA
• PR-80 and PR-81
• EPGREN
• RAPSUD
Water management practices, water harvesting
• Ministry of Water, Irrigation and Energy?
• Ministry of Agriculture

Agroforestry
• Capacity Building for Access and Benefit Sharing and Conservation of Medicinal Plants project?
• East Africa Bambu Project
Organic agriculture
• EOSA
• MELCA-Ethiopia

Low external input agriculture
• Ministry of Agriculture

• Home gardens
• Ministry of Agriculture

Areas designated by virtue of production features and approaches
• Konso Sustainable Land use Management
• Kefa Biosphere Reserve
• Sheka Biosphere Reserve
• Yayu Biosphere Reserve
• Semen National Park

Ecosystem approach to capture fisheries
• Water hyacinth control projects of Amhara and Oromia regions
• EIAR, MEF

Conservation hatcheries
• Regional Fishery Research Centers
• Community Based Integrated Natural Resource Management (CBINRe)
Reduced-impact logging
• REDD++

Diversification
• CRGE (Poultry Initiative)
Base broadening
• EIAR (crop improvement)
• Universities (Hawassa, Haromaya)

Domestication
• Capacity Building for Access and Benefit Sharing and Conservation of Medicinal Plants project?
Restoration practices
• Sustainable Land use Management

Management of microorganisms
• Canadian International Food Security Research Fund Project (Hawassa University)
• AAU, Haramaya University and Hawassa University, National Soil Laboratory (MOA)

Polyculture/Aquaponics
• AAU

Enriched forests
• Oromia Forest and wild Life Enterprise, Amhara forest Enterprise

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	N	Use of inorganic fertilizers and external inputs in Ethiopia is at low level as compared to the level of use in some other countries. Therefore, overuse can be considered as non existent.	Mesfin, 2009; Abush et. al., 2011
Over-use of chemical control mechanisms (e.g. disease control agents, pesticides, herbicides, veterinary drugs, etc.)	Y	Despite the fact that about three million farmers are using pesticides, there are reports that components of associated biodiversity (e.g. honey bee pollinators) are significantly affected by these pesticides.	Tadesse & Asferachew, 2008; CSA, 2009
Inappropriate water management	Y	Significant number of water bodies are being affected by reduction in water flowing into them and pollution. As a result, they are becoming poor habitats to associated biodiversity such as birds and aquatic plants.	Nedede et al., 2000
Practices leading to soil and water degradation	Y	Farming practices in steep slope areas are contributing to the decline and degradation of soil and water resources. These in turn, results in the degradation and loss of vegetation, thereby negatively impacting the associated biodiversity (bee colonies, microorganisms and lower plants)	Tamene & Vlek, 2008; Kassa et. al., 2013
Over-grazing	Y	The loss of vegetation as a result of overgrazing causes loss in associated biodiversity and wild foods of plant and animal origin.	
Uncontrolled forest clearing	Y	The loss of vegetation as a result of uncontrolled forest clearing causes loss in associated biodiversity and wild foods of plant and animal origin. Particularly, there is direct loss to wild edible plants.	Addis, 2009; Teklehaimanot & Gidey, 2010
Fishing in protected areas	N	There is some level of fishing practice in water bodies within protected areas (e.g. Abijata Shalla National Park). However, the magnitude of fishing may not be considered as a major cause to associated biodiversity and wild foods	www.ewca.gov.et
Overharvesting	Y	The loss of biodiversity through overharvesting causes loss in associated biodiversity and wild foods of plant and animal origin.	
Other [*please specify*):			

Add row
Delete row

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

Because of the national demand for increase in food production subsistence extensive type of farming is being replaced by market oriented and commercial intensive farming. The intensive type of framing required inter alia increased use of herbicides and pesticides to control weeds and other pests, respectively. Such increased use of agricultural chemicals, despite its positive role in increasing productivity by reducing damage from pests, it has a negative side and it affects the environment including biodiversity.

Similarly there is increase in irrigation agriculture by using the large number of rivers and other fresh water bodies. In some cases rivers which are flowing to lakes are being partially diverted for irrigation purpose reducing the amount of water flowing into the lakes. In addition to that the rivers would carry agricultural chemical residues into the lakes. In spite of the significant increase in agricultural production being realized from irrigation, the damage the reduction in water and pollution causes to the lake ecosystems and the biodiversity therein is sizeable.

Increase in population pressure and the desire to increase production during previous times through expansion of agricultural land into forest and sloppy areas has caused significant loss of vegetation cover and soil thereby affecting biodiversity. Limited increase in production has been achieved but the damage to the natural resources was quite high.

Similarly with population pressure, frequent drought the area for grazing and the amount of vegetation for grazing per unit of livestock has reduced. These have led to overgrazing of the range land with consequences of further degrading the range land vegetation and biodiversity. Despite increase in the number of livestock, productivity per unit of livestock has shown sizeable reduction.

The growth in alternative energy sources is not in match with growth in population. As a result increased demand for fire wood and the need for agricultural expansion have led into significant amount of forest clearing. This might have met the short term need of the population but it has caused long term damage to the natural resources including the biodiversity within.

Natural resources such as forests and water bodies are considered as communal properties where the community tries to maximize the share it gains from the resources. Management of the resources is taken for granted resulting in overexploitation of the resources. Appropriate examples in this regard are grazing lands in some pastoral areas, lakes providing fishing grounds and natural forests. Despite the contribution these resources provided in meeting short term needs significant loss to the resources and the biodiversity therein has been caused.

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

Over-use of artificial fertilizers or external inputs

Despite the low level of use of fertilizers as compared to the global average, there is lower efficiency of use of fertilizers as shown by the nutrient use efficiency as compared to efficiency in some other African countries (IFPRI, 2010). Improving plant uptake of the nutrient in the fertilizer through appropriate agronomic practices (e.g. tillage practice, time of application etc) can improve the loss of the fertilizers and the possible pollution it causes in the area. Extension work is implementing precision application as one way to improve the efficiency of fertilizer use. Additionally implementation of integrated soil fertility management and use of bio-fertilizers (e.g. rhizobia inoculants) is being pursued despite variation in the success rate (Mesfin Admasu, 2009).

Over use of chemical control mechanisms

The proportion of farmers using agricultural chemicals is limited with only about 3 million farmers using pesticides. However due to inappropriate use of the chemicals environmental damage is caused including loss of associated biodiversity. In the past policies guiding the use of agriculture chemicals have been issued (Bezabih Emana et al., 2012). Additionally the implementation of integrated pest management is being pursued to minimize use of agricultural chemicals.

Inappropriate water management

The introduction and promotion of the integrated watershed development program through the construction of physical and

biological conservation structures in order to enhance the hydrological cycle and to enrich soil and water conservation contributes to tackling problem of inappropriate water management. In addition to that, environmental impact assessment (EIA) is enacted and it is being implemented in licensing various investment activities. This would contribute to improving water management by removing factors that would exacerbate reduction in water flow to water bodies and entry of pollutants into water bodies.

Practices leading to soil and water degradation

The major factors which lead to soil and water degradation are population pressure, expansion of agriculture into forest areas and inappropriate farming practices. There is strong action towards natural resource conservation and revival of previously denuded areas. Despite differences in the success rate in the different parts of the country significant improvement have been registered in improving the vegetation and the soil cover. This is likely to contribute to the conservation of associated biodiversity.

Overgrazing

Overgrazing happens in a number of production systems (livestock grassland based, mixed system) where livestock production is a component of the system. Awareness raising on keeping small number of productive rather than large number of unproductive animals is being implemented to reduce the pressure on the grazing land. In addition to that water development activities in some pastoral areas are being implemented so that pressure on traditional watering areas can be reduced and the grazing land can be utilized evenly. Some pastoral areas are also being turned into plantations (sugar) so that the way of life of pastoralists can be changed into agro-pastoarlists, out growers or employee of plantations. All these initiatives would contribute to addressing problems related to overgrazing.

Uncontrolled forest clearing

Legislations have been issued which prohibit unauthorized felling of trees or clearing of forests. Despite problems with enacting the legislations there is improvement in terms of controlling forest clearing. Massive awareness creation on conservation and sustainable utilization of forests have been undertaken by the government and NGOs. Promoting use of non-timber forest products (e.g. forest coffee, honey, incense and gum) is being implemented and contributing to the protection of forests from uncontrolled clearing.

Fishing in protected areas

There are lakes which have been designated as protected because of their aesthetic value and riches of diversity, mainly birds. Fishing takes place in these lakes. In addition to that, there is significant pollution to the lakes from agricultural chemicals being used by the surrounding farmers. Except the existing policies, implementation of which can bring some protection to the fishing areas, there is no information available on specific actions taken to protect these areas and loss of the associated biodiversity.

Overharvesting

In most of the resources which are considered as communal properties (e.g. grazing land, natural forests, lakes) overharvesting is a common practice as users try to maximize the current benefit they obtain from the resources. There are policies, legislations and initiatives (projects) which contribute to the conservation of the resources and thereby to the associated biodiversity. There is need to effective implementation of these policies.

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: Tropics	Range vegetation	1	Due to bush encroachment and invasion by plant species, there is reduction in vegetation diversity available to livestock. As a result, there is reduced livestock productivity and food availability.	In pastoral areas, livestock is a major source of livelihood (income, food, security). With reduction in livestock productivity, the livelihood of pastoralists is negatively affected.	Niguse & Gizachew, 2014
Livestock landless systems: Tropics	Exotic livestock	1	Exotic cattle and poultry which are being used in this system are selected for production under high input intensive systems and are more or less uniform. Their survival and production performance declines drastically under the sub-optimal management condition that is affordable by producers, hence affecting food production.	The low survival and productive performance of exotic animals under sub-optimal management in the landless system reduces income and food supply of producers thereby affecting livelihood.	Gillah et al., 2012

Production system	Biodiversity component for which diversity is lacking	Extent of problem (2,1)	Effect on food security and nutrition	Effect on livelihood	Reference
Naturally regenerated forests: Tropics	Forest biodiversity (flora, fauna & microbial genetic resources)	1	Because of population pressure, land use & climate change, habitat alteration, over exploitation, invasive sp, fire hazard & other related degradation factors, the availability and diversity of wild foods is declining through decades. In addition, as a result of degradation of forest vegetation, soil erosion, loss of soil fertility and moisture stress have negatively impacted the production & productivity of the agricultural sector.	The outcome of degradation of forest biodiversity is negatively affecting the lively-hood of the whole nation in general & the rural community in particular, who are depending on the resource base for subsistence & income generation	CSA and ICF International, 2011; IBC, 2012d; Rezene Fessehaie, et al. 2012; MoFED, 2011; Tesfaye Belay and Zimmermann, 2006;
Self recruiting capture fisheries: Tropics	fish	1	The use of inappropriate fishing gears, overfishing and the expansion of alien invasive species (water hyacinth) has significantly affected the fish yield and diversity. This has reduced fish available for consumption.	With reduction in fish catch the amount available for consumption and sale has shown reduction. Therefore the reduction in food and income causes negative effect on livelihood.	Tefera, 1994; Gebremariam, 2002

Production system	Biodiversity component for which diversity is lacking	Extent of problem (2,1)	Effect on food security and nutrition	Effect on livelihood	Reference
Irrigated crops (other) : Tropics	Honey bees, fish	1	The over use of pesticides and herbicides has significantly affected the diversity of non targeted honey bees, thereby, negatively, affecting pollination and productivity. Moreover, drainage of nitrogen and phosphorus from irrigated agricultural fields to fresh water depletion of fish diversity	The reduction in pollination activity causes reduction in crop yield while decrease in fish yield would result in reduction of food and income with cumulative effect on livelihood	Haftom & Belay, 2014; Katherine & Hendrik, 2010

Production system	Biodiversity component for which diversity is lacking	Extent of problem (2,1)	Effect on food security and nutrition	Effect on livelihood	Reference
Mixed system: Tropics	Livestock, Vegetation (crop, forage)	1	Shift to market oriented crop production, disease and pests, frequent drought and unreliable rainfall are affecting crop biodiversity. On farm diversity on small-scale production system is a risk management strategy hence lack of diversity has a negative impact on food security and nutrition. Regarding livestock, some cattle breeds are affected (Sheko, Fogera), as a result of interbreeding and a change in the production system resulting in the decline of the pure indigenous breeds. Forage resource in this production system is also threatened by overgrazing threatening livestock diversity and food security.	Crops and livestock are main sources of livelihood in the mixed system. Diversification is a coping mechanism of food security, production and market risks. Lack of such diversity affects the livelihood of the population dependent on the resource.	Abraham et al., 2012; Rehima M., et al., 2013; IBC, 2009

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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.

Productivity;

Large number of accessions of a number of food crops from the national ex situ collection have been utilized in development of improved varieties. The use of these varieties in the extension system has resulted in significant increase of productivity. In addition to that, natural resource conservation activities are playing important role in improving soil fertility and maintenance of associated biodiversity. These in turn have contributed to increased agricultural productivity.

Food security and nutrition;

With increased productivity of diverse food crops caused by increased use of improved varieties, significant improvement has been achieved in food security and nutrition.

Rural livelihoods;

With increased productivity of food crops, income and food security, thereby livelihood, in the rural area have improved significantly.

Ecosystem services;

The aggressive natural resource conservation activity in Ethiopia has improved vegetation and soil cover in most of the ecosystems. This in turn has improved ecosystem service in terms of soil fertility, nutrient and water cycling, water filtration, pollination, etc.

Sustainability;

With increased use of varieties developed from crop landraces and improving in conservation of natural resources, improved sustainability in use of biodiversity for food and agriculture is being achieved.

Resilience;

A number of varieties which are drought and disease tolerant have been developed from crop landraces. This has contributed to resilience in areas where moisture stress and disease outbreak has been experienced.

Sustainable intensification.

Despite the inappropriate use of imported crop and animal genotypes in low input systems, where they are not fit, introduction of exotic animals, improved varieties of fruits and vegetables into the intensive agricultural production systems has played significant role in improving productivity and has contributed to sustainability of the production system.

To strengthen the contribution of biodiversity in food security and nutrition, the introduction of new varieties of fruits and vegetables (with management practices) has been carried out in different parts of the country. This has contributed to improved productivity, nutrition and livelihood. For example, in Southwestern Ethiopia, new varieties of fruits and vegetables, the use of organic manure and integrated pest management, have resulted in a 70% improvement in nutrition and a 60% increase in crop yields (Scialabba and Hattam, 2003). Productivity of agricultural crops has also increased by 40% between 2005 and 2010 as result of use of integration of different crop management systems and also the use of improved varieties. Most of these improved varieties are developed from landraces by agricultural research centers in the country. These activities are carried out mainly in the mixed system. Livestock are sources of food and livelihood in the grassland based system. To strengthen their contribution, strategies have been devised to improve pasture management within a value chain approach (e.g. CRGE).

To improve rural livelihoods using biodiversity for food and agriculture, maintaining the diversity and crating market link is important. For this, marketing strategy for agro-biodiversity products (coffee, durum wheat, teff and enset) has been developed, and market linkages have been created. This will deliver benefits to 47,082 households in Oromia, Amhara, SNNP regions (UNDP, 2013). Value added agricultural products are also being promoted and marketed through various farmer communities (Kassa Getu Dereje, 2014)

Biodiversity for food and agriculture also serve as a coping mechanism for climate change. There is a need of crop varieties that can be grown in the changed environment to reduce the impact of climate change. One of the means to deliver these varieties is to use ex situ and in situ conserved genetic materials. These genetic materials are being used as an adaptation options to climate change. Projects are being carried out to identify and test these resources and disseminate them to farmers to be used as an adaptation mechanism. This activity is carried out in the mixed production system.
With regard to sustainable intensification, a system of crop management has been introduced to test the impact of using a 'system of crop intensification' (SCI) based on raising seedlings, transplanting at a young age with wide spacing. Ethiopia's Agricultural Transformation Agency is applying, evaluating and extending SCI concepts and practices to raise production of the country's main staple grain, tef. In the 2012/13 cropping season, 160,000 Ethiopian farmers who participated in on-farm trials with the less-intensive, direct-seeded version got an average yield increase of 70%, while another 7,000 farmers who used the recommended, more-intensive methods that involved transplanting had yield increases of 200% to 300%, with 50% to 90% reductions in seed (ATA, 2013, Binju Abreham et al., 2014).

Forests are sources of wild food and they also provide various ecosystem services. To strengthen their contribution, they need to be utilized sustainably and for this a participatory forest management (PFM) scheme has been developed and implemented. In Amhara National regional State, PFM has been implemented on 82,000ha of natural forests. In Oromia national regional state it is being implemented in 10 forest areas covering a total of 333,704ha, with 76 cooperatives consisting of 148,796 members of local communities (EBI/report, 2014). This activity is carried out in Natural forest and planted forest production system.

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.

There is no information on the proportion of the population in Ethiopia that uses wild food on a regular basis. In Benishangul Gumuz region where wild foods contribute at a much larger magnitude to food supply than in other areas, 30-40% of food consumption comes from wild edible plants. In some other localities of the country, as high as 60% (Reference 1) and

56.3-66.7% (Mekuanint et al., 2014) of the population consume wild edible plants. In Gambella, the proportion of the population consuming wild food of animal origin is reported to exceed 50%. There is also no information on the contribution of wild food to the proportion of the diet consumed. The consumption of wild foods is mainly for subsistence (filling food gaps) and supplementary purposes (Mekuanint et al., 2014).

In some areas, collection and preparation of wild edible plants is mainly accomplished by women (Tilahun & Mirutse, 2010,). However, there is no gender disaggregated data.

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)	Importance assigned to the ecosystem approach (2,1,0,NA)	Importance assigned to the ecosystem approach (2,1,0,NA)
Naturally regenerated forests: Tropics	Biosphere reserves	1	2
Naturally regenerated forests: Tropics	Protected areas (PAs)	1	2
Naturally regenerated forests: Tropics	Area closures	2	2
Naturally regenerated forests: Tropics	Sustainable forest management	1	2
Planted forests: Tropics	Integrated water-shade development	2	2
Planted forests: Tropics	Sustainable forest management	1	2
Self-recruiting capture fisheries: Tropics	Integrated watershed management	1	2
Irrigated crops (other): Tropics	Integrated Pest Management (IPM)	1	2
Mixed systems: Tropics	Integrated watershed management	1	2
Mixed systems: Tropics	Area closure	1	1

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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.**

Naturally regenerated forests:
a. The specific actions that have been taken to ensure adoption:

Endorsement & approval of international and regional policies & initiatives, development of national policies and strategies, institutional setup, budgeting of resources were among the first measures taken to ensure adoption. In addition, identification of relevant stakeholders, awareness raising, development of management plans, site identification and establishment, and implementation of plans and monitoring & evaluation activities are also among the actions that have been taken to promote adoption.

b. Any observed results from adoption:

Awareness is raised on the issue of conservation, development and sustainable utilization of natural resources in general and forest genetic resources in particular at all levels. Though there is no any official management plan of the biosphere reserves, experiences revealed that, there are promising results as to getting community participation in designing biosphere reserve management plans and their temporary execution, and assuring security of forest areas reserved for conservation. In addition, the rural community is benefiting from harvesting of non timber forest products such as forest coffee, honey, spices and etc from the development zone within the biosphere reserves The human and livestock encroachment into biosphere reserves, protected areas and area closures has relatively decreased compared to the previous times and sentiment of belongingness has been developed. Because of the promotion and development of ecosystem approach, the community is benefiting from ecosystem services like pollination, reduced soil erosion, nutrient recycling, adequacy in water availability & quality and others. This stands true also in areas where participatory forest management, Carbon Trade and other initiatives are being exercised.

c. Plans for adoption or for further adoption in new or existing production areas:

Building partnerships among business, government, and civil society to integrate ecosystem approaches into investment planning at both macro and micro levels is one of the future plans for adoption of different ecosystem and landscape approach through Global Partnership for Development. There is also a plan to include two natural forest areas as biosphere reserves that are ecologically, economically and socially important. In addition, given that all resources are available, the number of protected areas, area closures and sustainable forest management areas will be increased. As to the future plan of Ethiopia, massive tree plantings to increase the forest coverage, designation of wetlands and restoration of degraded areas will be adopted as ecosystem and landscape approach in different parts of the country.

d. Lessons learned:
Awareness raised at all levels, stakeholder participation, commitment and adequate resourcing played a significant role in impacting the conservation, development and sustainable utilization of natural resources in general and forest biodiversity in particular through sustainable management of the resource base by promoting ecosystem and landscape approach.

Planted forests

a. The specific actions that have been taken to ensure adoption:
Integrated water-shade development and sustainable forest management are the two ecosystem approach identified within this production system. Development of legal frame work, institutional setup, awareness raising, promotion of stakeholder participation, resourcing and community mobilization are among the specific actions taken to ensure adoption. (For additional information please refer to the “naturally regenerated forests” production system).

b. Observed results from adoption:

Awareness is raised on the issue of conservation, development and sustainable utilization of natural resources in general and forest genetic resources in particular at all levels. Through the development of forest plantations and integrated watershed management in Tigrai, Amhara, Oromia and Southern Nations, Nationalities and Peoples Regional State (SNNPRS), and in other parts of the country, vegetation rehabilitation, erosion reduction, water infiltration and provision and soil nutrition is significantly improving from time to time. In addition, increased agricultural production and productivity, improved availability of forage in quantity and quality, micro climate stability and increased ecosystem services, livelihood diversification & income generation are among the results from adoption.

c. Plans for adoption or for further adoption in new or existing production areas:

The ongoing huge efforts of forest ecosystem restoration through area enclosures and massive tree plantings in Ethiopia will be strengthened in the coming decades. Increasing forest cover, designation of wetlands and restoration of degraded areas are among the major prospects of the country required to be realized in the future. (For additional information please refer to the “naturally regenerated forests” production system).

d. Lessons learned:
Development of legal frame work, institutional setup, raising awareness at all levels, stakeholder participation, commitment and

adequate resourcing played a significant role in impacting the development and sustainable management of forest plantations and the rehabilitation of degraded lands through integrated watershed management by promoting ecosystem and landscape approach. In this regard, it is worth to mention the significant impact of mobilizing the community & developing commitment towards achieving sound and effective rehabilitation of degraded lands through integrated watershed management. In general, the implementation of CRGE is positively impacting both the ecosystem & landscape approach.

Self recruiting capture fisheries: Tropics

a. The specific actions that have been taken to ensure adoption

Integrated watershed management is practiced to restore the whole biodiversity of some of the lakes (e.g. Lake Haramaya, Lake Hawassa, Lake chitu and Lake Tana). However, as a result of lack of attention to aquatic ecosystems of the country conservation efforts have shown minimal effects. .
b. Any observed results from adoption

Lake Haramaya is showing a sign of restoring as a result of combined efforts of integrated watershed management by community government and non-Government organizations.
c. Plans for adoption or for further adoption in new or existing production areas.
The country is directing its development in the direction of green economy, this would create opportunity for more actions to protect the water bodies and implement Integrated watershed mangment in more area than currently implemented..

d. lessons learned

As a result of drying up or reduction in water volume of some lakes and associated loss of biodiversity awareness has been created on the need to manage water bodies properly. The integrated watershed management, in some areas, have been shown to bring positive change in improving the amount of water (e.g. number of springs increased) as a result the approach is becoming popular and serving as incentive for community mobilization.

Irrigated crops (other): Tropics

• The specific actions that have been taken to ensure adoption;
With a recent increase in irrigated crops, pests and diseases have been identified to be among major constraints (ARARI, 2009). Technologies to control pests are being developed. Use of chemicals alone has its negative environmental effect and integrated pest management is being recommended. This system uses a combination of protection methods which include biological, physical and chemical control. The extension system pursues this approach but information on adoption rate is lacking.
• Any observed results from adoption;
Despite lack of quantified Information on adoption rate of IPM in irrigated crops it appears that farmers awareness has been raised and uptake of the approach would increase for both environmental and economical reasons.
• Plans for adoption or for further adoption in new or existing production areas;
The agricultural extension system follows the IPM approach in crop pest control under both irrigated and rain fed agriculture and development agents provide advisory service in all rural areas.
• Lessons learned.
The environmental cost of use of chemicals in pest control in agriculture in general and in irrigated agriculture in particular has been understood and the integrated pest management approach is being promoted in the agricultural extension system. Adoption rate need to be quantified and evaluated so that any problem that may exist can be identified.

Mixed system:
a. Actions taken to ensure adoption
To ensure adoption of these approaches, awareness raising of the general public and decision makers on biodiversity issues has been conducted. Experience sharing programmes among national regional states on soil and water conservation activities and scaling-up of the best practices to new areas was also carried out.

b. Observed results from adoption
Integrated watershed approach to conserve soil and water schemes have been carried out in 57,000 community based watersheds that cover about 13 million hectares of land. In addition, about seven million hectares of degraded area has been rehabilitated using area closure. Most of these areas are located in the mixed production system.
As a result of land rehabilitation activities, increased availability of water, and introduction of new agricultural practices, land and crop productivity and additional area for cultivation have increased over the years. In terms of socio-economic indicators, farm income has increased on average by 50 percent and 20 to 90 percent improvement in food security were reported (Gebrehaweria Gebregziabher, 2012).

c. Plans for further adoption
The agriculture sector recognizes the importance of conserving natural resources, of which biodiversity is the core component for sustainable development. Mainstreaming natural resource conservation into the agriculture sector is helping to reduce pressure on biodiversity. Strengthening natural resource conservation and use, strengthening conservation and use of water resources, and building capacity on natural resource conservation are plans set to be executed in this production system which help to strengthen and adopt these approaches in existing and new areas. Restoration of degraded areas is also a component of one of the targets in the country's biodiversity strategy and action plan.
d. Lessons learned
The success in the implementation of these approaches showed that, participatory planning, public mobilization and coordination are crucial to adopt these them and effect changes.

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?**

- What are the major gaps in information and knowledge?
  - There is lack of information on the magnitude of use of the different management practices in relation to biodiversity for food and agriculture in the various production systems.
- What are the main capacity or resources limitations?
  - There are limitations of financial, human and material resources to address research and development aspects of management practices so as to favor the use of biodiversity for food and agriculture.
- What are the main policy and institutional constraints?
  - There are no policy limitations with regard to management practices that favor the use of biodiversity for food and agriculture. However, implementation is fraught with lack of integration among institutions in terms of effecting the various management practices.
- What actions are required and what would be the priorities?
  - Information on the magnitude of use of the management practices need to be generated.
  - There is need for integration of actions by different institutions implementing the various management practices that favor the use of biodiversity for food and agriculture.

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?**

a. What are the major gaps in information and knowledge?
• Most reports indicated that there is lack of awareness on the significant contribution of wild edible foods for food security and in enhancing sustainable utilization of biodiversity for food and agriculture. Lack of information and knowledge on the magnitude of effect of drivers and interventions on biodiversity for food and agriculture is also another gap.
b. What are the main capacity or resources limitations?
• Lack of finances and adequate research on underutilized food sources including wild edible foods.
c. What are the main policy and institutional constraints?
• Inadequate implementation of sustainable use regulation and monitoring systems
• Weakening of traditional resources management systems/institutions positively contributing for the conservation of biodiversity for food and agriculture.
d. What actions are required and what would be the priorities?
• Research on underutilized and wild foods should be strengthened
• Research on determining the magnitude of effect of drivers and interventions should be undertaken.
• Improve implementation of regulation on sustainable utilization of biodiversity for food and agriculture
• Traditional resources management systems/institutions should be strengthened

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?

a. What are the major gaps in information and knowledge?
• Detailed and research based information are lacking on the contribution of biodiversity in improving productivity, food security and nutrition, livelihoods, ecosystem services, sustainability, resilience and sustainable intensification.
• Lack of data base on the various aspects of biodiversity for food and agriculture to serve as information hub.

b. What are the main capacity or resources limitations?
• Inadequate financial resources limit the extent research addresses the information gaps in biodiversity for food and agriculture.
•
c. What are the main policy and institutional constraints?
• Lack of integration among stakeholders involved in activities pertaining to biodiversity for food and agriculture, which led to duplication of efforts and unwise use of resources.

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

• Filling information and knowledge gaps in the various aspects of biodiversity for food and agriculture through research and adequate financing.
• Establishment of a national data base on biodiversity for food and agriculture.
• Integration of actions of the various stakeholders involved in research and development of biodiversity for food and agriculture.

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?

a. What are the major gaps in information and knowledge?
• There is lack of information and knowledge with regard to ecosystem approach.
• There is lack of exchange of information in adoption of ecosystem approaches.
b. What are the main capacity or resources limitations?
• Inadequacy in finance and resources limit the extent of adoption of ecosystem approaches.
c. What are the main policy and institutional constraints?
• There is no specific policy that addresses ecosystem approaches though the issue is incorporated in some sectorial policies.
• Absence of integration among institutions and stake holders in adopting and implementing ecosystem approaches.
d. What actions are required and what would be the priorities?
• Develop efficient information system among institutions and ensure its exchange.
• Secure adequate funding to ensure the implementation of ecosystem approaches.
• Ensure the integration of stakeholders
• Specific policy should be adopted to address the issue of ecosystem approaches.

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

The Conservation Strategy of Ethiopia
The Conservation Strategy of Ethiopia (1997) provides a comprehensive and rational approach to environmental management in a very broad sense, covering national and regional strategies, sectoral and cross sectoral policies, action plans and programmes as well as providing the basis for development of appropriate institutional and legal frameworks for the implementation. One of the issues in the strategy is the preservation, development, management and sustainable utilization of the diversity of gene pools of Ethiopia's species of wild and domesticated flora and fauna and its natural and human-managed ecosystems for the country's social and economic development and for the integrity of the biosphere. To implement this strategy, different institutions with specific mandate to work on conservation, development and utilization of Forest, aquatic, animal and plant genetic resources are established and are functional.
Environmental Policy
The Environmental Policy of Ethiopia (1997) has an overall goal to improve the health and quality of the life of all Ethiopians, and promote sustainable social and economic development by adopting environmental management principles. The policy includes important requirements for Environmental Impact Assessment (EIA) such as recognition of the need for EIA to address social, socio-economic, political and cultural impacts, in addition to physical and biological impacts; incorporation of impact containment measures within the design process, and for mitigation measures and contingency plans to be incorporated within

environmental impact statements (EISs). To safeguard biodiversity of the country, various regulatory measures (eg. environmental pollution control, solid waste management, fisheries guideline, floriculture code) are devised and implemented.

Development, Conservation and Utilization of Wildlife (Proclamation No. 541/2007)
The objectives of this proclamation are; conservation, management and development and properly utilize the wildlife resources of Ethiopia, create conditions necessary for discharging government obligations assumed under treaties regarding the conservation, development, and utilization of wildlife and promote wildlife-based tourism and to encourage private investment. Protected areas are important in maintaining stability in agricultural systems.To help ensure that Ethiopia's biodiversity and ecosystems are safeguarded from anthropogenic pressures, and are represented in a sustainable protected area system, additional protected areas have been established (eg. Semien-Gibe, Garameba community conservation areas) and management plans have been developed for some of the protected areas in the country (eg.Bale mountain national park).
Fisheries Development and Utilization (Proclamation No.315/2003)
Ethiopia has immense fisheries potential which could serve as important source of food and economic benefits. Therefore, there is a need for rational utilization and development of the resource base through, inter alia, enacting fisheries development and utilization law. The objectives of the Proclamation are to conserve fish biodiversity and its environment as well as to prevent and control overexploitation of the fisheries resource, to increase supply of safe and good quality fish and to ensure a sustainable contribution of the fisheries towards food security and to expand aquaculture. The extent of implementation of the proclamation is minimal and many of the water bodies in the country continue to be affected by anthropogenic pressures.

National Aquaculture Development Strategy
The overall objective of National Aquaculture Development Strategy of Ethiopia is to define a regulatory framework and build a strong basis for the development of aquaculture in the country. The strategy seeks to integrate the aquaculture industry into the agricultural sector and to facilitate development of viable aquaculture plans. It also aims to provide a framework in which the aquaculture industry can be developed in an economically, socially and environmentally sustainable manner. Aquaculture development is to be targeted as an activity to ensure food security, alleviate poverty of rural farmers and to provide fish for domestic consumption and industry. Presently aquaculture development in the country is at low level.
Forest policy and Forest development conservation and utilization (Proclamation 542-2007)
The basic aim of the policy (2006) is to meet public demand in forestry products and foster the contribution of forests in enhancing the economy of the country; through appropriately conserving and developing forestry resources. The specific objectives of the policy and Strategy related to integrated conservation and sustainable utilization of biodiversity for food and agriculture are: Fostering the contribution of forestry resources to food security and industrial development through the identification, rejuvenation, multiplication and distribution of forest plant species that are suitable for our country and capable of giving diverse utilities. The role of development, conservation and utilization of forest in playing a decisive role in preventing soil erosion, expansion of desertification, disturbance of ecological balance, depletion of biodiversity and reduction of agricultural production due to the alarming situation of forest degradation in the country is asserted in the proclamation.

Forests are sources of wild food and non wood forest products (eg. spices, forest coffee). They also support sustainable agriculture through provision of fertile croplands, and support through services such as pollinators, biological controllers, gene pool for crop improvement, watershed protection, organic fertilizer, farm implements, fodder and bee forage. To enhance the benefit of forests, resource assessment, developing management plans for protected areas, preparation and implementation of forest management and land use guidelines, and organizing local communities around parks and users of non-timber forest products are among the actions that have effectively been carried out in most of the national regional state to implement objectives under this policy.

Biosafety Proclamation (No.655./2009)
This Proclamation provides rules for the handling and use of Genetically Modified Organisms (GMOs) so as to protect human and animal health, biological diversity and in general, the environment, local communities and the country at large. It aims at preventing or at least managing down to levels of insignificance the adverse effects of modified organisms. No person shall engage in any transaction without obtaining an advance informed agreement from the Environmental Protection Authority, i.e. a written consent granted by the Authority for the undertaking of a transaction in accordance with this Proclamation. A transaction here means any making or use of any modified organism in teaching, production, import, export, transit, release, contained production, transport, placing on the market, or use as pharmaceutical, as food, as feed or for processing. So far, no known GMOs are produced in the country.

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

Proclamations/strategies listed below support the conservation and sustainable use of associated biodiversity;
Apiculture Resources Development and Protection Proclamation (No. 660/2009)
This Proclamation provides for the conservation of the biodiversity of honeybee races and honey source plants and the development of the apiculture and the production of honey products. The Proclamation provides rules for the authorization of beekeeping activities including migratory beekeeping and for the protection of indigenous honeybee species from communicable honeybee diseases. The Proclamation also, provides some rules relative to importation of bees and bee

products, provides for appointment and functions of apiculture resources development inspectors and defines offences.
In recent times, beekeeping technology has been integrated with conservation of watershed programs and it is contributing to enhance the income of household and is encouraging planting of bee forages which directly contributes for sustainable watershed managements.

The Conservation Strategy of Ethiopia
The Conservation Strategy of Ethiopia (1997) provides a comprehensive and rational approach to environmental management in a very broad sense, covering national and regional strategies, sectoral and cross sectoral policies, action plans and programmes as well as providing the basis for development of appropriate institutional and legal frameworks for the implementation. One of the issues in the strategy is the preservation, development, management and sustainably utilizes the diversity of gene pools of Ethiopia's species of wild and domesticated flora and fauna and its natural and human-managed ecosystems for the country's social and economic development and for the integrity of the biosphere.

Environmental Policy
The Environmental Policy of Ethiopia (1997) has an overall goal to improve the health and quality of the life of all Ethiopians, and promote sustainable social and economic development by adopting environmental management principles. The policy includes important requirements for Environmental Impact Assessment (EIA) such as recognition of the need for EIA to address social, socio-economic, political and cultural impacts, in addition to physical and biological impacts; incorporation of impact containment measures within the design process, and for mitigation measures and contingency plans to be incorporated within environmental impact statements (EISs).

Forest policy and Forest development conservation and utilization (Proclamation 542-2007)
The basic aim of the policy (2006) is to meet public demand in forestry products and foster the contribution of forests in enhancing the economy of the country; through appropriately conserving and developing forestry resources. The specific objectives of the policy and Strategy related to integrated conservation and sustainable utilization of biodiversity for food and agriculture are: Fostering the contribution of forestry resources to food security and industrial development through the identification, rejuvenation, multiplication and distribution of forest plant species that are suitable for our country and capable of giving diverse utilities. The role of development, conservation and utilization of forest in playing a decisive role in preventing soil erosion, expansion of desertification, disturbance of ecological balance, depletion of biodiversity and reduction of agricultural production due to the alarming situation of forest degradation in the country is asserted in the proclamation.

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

The National nutrition program/Ethiopia
The national nutrition program (2013-2015) has included biodiversity related initiatives to be carried out by relevant stakeholder to addressed nutrition problems. These include: Increase production of fruits, vegetables, nutritious roots, cereals and pulses to improve the consumption of a diversified diet at household level; improve access to and utilization of animal source foods; increase production and consumption of fish; and support agricultural research centers to develop seeds of high nutritional value.

Rural Development Policies, Strategies and Instruments (RDPSI)
Policies aimed at strengthening agricultural development and increasing food security are essential components to promote improved nutrition. These policies ensure that nutritious food is affordable and accessible. According to RDPSI, agriculture is given the priority to lead the overall economic development and measures are being taken to create a supportive and favorable policy environment to promote the private sector and to transform agriculture from subsistence to market oriented smallholder farming.

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

Forest policy and Forest development conservation and utilization (Proclamation 542-2007)
The basic aim of the policy (2006) is to meet public demand in forestry products and foster the contribution of forests in enhancing the economy of the country; through appropriately conserving and developing forestry resources. The specific objectives of the policy and Strategy related to integrated conservation and sustainable utilization of biodiversity for food and agriculture are: Fostering the contribution of forestry resources to food security and industrial development through the identification, rejuvenation, multiplication and distribution of forest plant species that are suitable for our country and capable of giving diverse utilities. The role of development, conservation and utilization of forest in playing a decisive role in preventing soil erosion, expansion of desertification, disturbance of ecological balance, depletion of biodiversity and reduction of agricultural production due to the alarming situation of forest degradation in the country is asserted in the proclamation.

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

Climate Resilient Green Economy (CRGE) strategy
Ethiopia has devised CRGE strategy which will allow a green growth path and fosters development and sustainability. The CRGE initiative follows a sectoral approach, and as part of the strategy, the government has selected four initiatives, namely: exploiting the vast hydro-power potential; large-scale promotion of advanced rural cooking technologies; efficiency improvements to the livestock value chain; and Reducing Emissions from Deforestation and Forest Degradation (REDD) as the best chances of promoting growth immediately, capturing large abatement potentials, and attracting climate finance for their implementation. Ethiopia's economy and the wellbeing of the society are closely linked to agriculture and the use of natural resources such as water, land, forests and fisheries; adaptation and mitigation actions towards climate resilience will come in part through focusing on improving performance and management in these resources and the activities planned to be undertaken in the strategy will have a positive impact on conserving biodiversity.

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.

Access to Genetic Resources and Community Knowledge, and Community Rights Proclamation (No. 482/2006) and Regulation (169/2009)
After ratifying the Convention on Biological Diversity (CBD) and International Treaty on Plant Genetic Resources for Food and Agriculture, as well as adopting international model laws and guidelines, Ethiopia has issued Access to Genetic Resources and Community Knowledge, and Community Rights Proclamation (No. 482/2006) and Regulation (169/2009). Recently, the country has ratified the Nagoya Protocol, which will enhance the implementation of the national Access and Benefit Sharing laws.

Plant Breeders Right (Proclamation No. 481/2006)
This proclamation deals, inter alia, with the protection of community knowledge relevant to plant genetic resources and obtaining an equitable share of benefits from the use of plant genetic resources. It also allows farmers to exchanging and selling farm-saved seed or propagating material of the farmers' varieties; as well as the new plant varieties protecting under breeders' rights, to collectively save, use, multiply and process farm-saved seed of protected varieties.

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.**

Sustainable Land Management Program
This program was launched in 2008 and the first phase was completed by the end of September 2013. The program had the principal objectives of reducing land degradation in agricultural landscapes and improving the agricultural productivity of smallholder farmers. It had several components including scaling-up of best practices in watershed management and strengthening land tenure through land certification and knowledge management. The programme has had a number of successes. For example, in Amhara, Oromia and Tigray regions about 77,000 hectares of land have been rehabilitated; a further 79,000 hectares of forest have been established as Participatory Forest Management sites and these are managed in partnership with local communities; and approximately 50,000 households have adopted sustainable land management practices.

Integrated watershed management
soil and water conservation schemes have been carried out in 57,000 community based watersheds that cover about 13 million hectares of land. The soil and water conservation structures have been supported with biological soil conservation measures such as planting of multipurpose trees, shrubs and grasses. Bylaws agreed and approved by communities have become operational to govern the management and use of communal lands. Forest management plans have also been prepared for 1.4 million hecatres of natural forests. Moreover, about 2.9 million hectares of land have been afforested with different tree species. In years 2011 through 2013, for example, a total of 16.8 million seedlings of indigenous and exotic trees have been planted in various parts of the country (MoA, 2014a,b).

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.

Productive Safety Net Program and associated schemes
The Ministry of Agriculture has a food security program that aims to sustainably ensure adequate quantity and quality of food. One of the components of the program is the Productive Safety Net Programme (PSNP). The main objective of PSNP is to protect food consumption of chronically food insecure rural households. The program operates in 319 districts in 8 regional states. PSNP has included soil and water conservation measures as part of a public works element. The program has also mechanism of addressing transitory food insecurity through its Contingency Budget and Risk Financing Mechanism. PSNP is credited for improvements in natural resource management and environment through the soil and water conservation measures carried out by the beneficiary households which results in reduced surface runoff and soil erosion; increased infiltration; raised groundwater levels and enhanced spring yields; increased stream base flows; increased vegetation cover and biomass; improved production and productivity and livelihood diversification. ++++CRGE

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.).

National Adaptation Program of Action (2007)

Ethiopia has prepared and submitted its National Adaptation Programme of Action (NAPA) in June 2007. A Multi-Criteria Analysis was carried out in order to come up with the short-list of suggested adaptation o

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)?**

Conservation of biodiversity including biodiversity for food and agriculture is supported by a national policy in a form of legislation that established an institution which is specifically mandated to deal with all forms of biodiversity. The institution currently named as Ethiopian Biodiversity Institute is mandated for the conservation, sustainable use and regulating access and benefit sharing of the country's biodiversity. The institute is structured as four sectorial and one cross-sectorial directorates. The sectorial directorates deal with animal, crop, forest, microbial genetic resources while the cross-sectorial directorate deals with access and benefit sharing pertaining to the genetic resources. A national biodiversity strategy and action plan has been prepared to guide the conservation, sustainable utilization and access and benefit sharing aspect of the country's biodiversity. Institutionally in addition to those directly related to agriculture, Ethiopian Wildlife Conservation Authority, Ministry of Environment and Forest, Ministry of Education (mainly Higher Learning Institutions), Ministry of Culture and Tourism, Ministry of Health, pastoral agencies, several international, regional and local NGOs that are involved in biodiversity related activities in Ethiopia are engaged in one or the other aspects of biodiversity conservation. Mainstreaming of biodiversity issues in the education sector, the inclusion of biodiversity as major component of environmental and natural resources protection, the due consideration being given to medicinal plant diversity by the health sector, management of biodiversity for tourism purpose, utilization of biodiversity in the industrial sector are actions which verify the inclusion of aspects of biodiversity in national planning and policy development of sectors other than agriculture.

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
Insect pollinators	With a policy of agriculture to play a leading role in the economy and the increase in population, there is critical need to boost agricultural production, particularly crop production. Intensification is being implemented to achieve the increase in production. Additionally some horticultural cops (including flowers) are becoming a source of foreign currency which is an important element in the country's development. The use of agricultural chemicals (pesticides and herbicides) is on the rise and creating significant damage on insect pollinators. It is difficult to have a legislation that protects insect pollinators against agricultural chemicals and at the same time increase productivity through intensification.
Insect pollinators	The need to increase agricultural production through intensification which require increased use of external inputs such as pesticide and herbicides.
Avian pollinators and seed dispersers	In avian pollinators similar situation occurs with the use of agricultural chemicals. Aquatic and wetland habitats are being polluted by agricultural and industrial chemicals, and urban waste.
Plants (forming vegetation cover, fixing nitrogen)	The need for clearing large cultivable area by emerging commercial farm investments. The inadequate supply of and access to alternative energy sources to fuel wood.
Nutrient cycling microorganisms	The level of understanding and technology is at low level to legislate and enforce actions that protect loss of microorganisms explicitly.

Add row

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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.

With a policy of agriculture to play a leading role in the economy and the increase in population, there is critical need to boost agricultural production, particularly crop production. Intensification is being implemented to achieve the increase in production. Additionally some horticultural cops (including flowers) are becoming a source of foreign currency which is an important element in the country's development. The use of agricultural chemicals (pesticides and herbicides) is on the rise and creating significant damage on insect pollinators. It is difficult to have a legislation that protects insect pollinators against agricultural chemicals and at the same time increase productivity through intensification.

Similarly birds which have seed dispersing and pollination and pest control role are highly affected. Development of new legislations and enforcement of the existing ones is fraught with problems of harmonization of conservation of the birds with the need for increased use of the chemicals to ensure increased agricultural productivity and production.

Investment in large commercial farming in the country is on the rise. It is believed that these commercial farms contribute to modernization of the agricultural sector, production of exportable crops and increase of productivity. However, they require large tract of uninhabited land. Such land is obtained by clearing of forest or range land. In addition to that, because of inadequacy of household energy supply, significant proportion of the population utilizes firewood to meet household energy needs. These have led to significant loss of the vegetation cover and the ecosystem service the vegetation can provide. Harmonizing the demand of investment in the agriculture sector for land, the need for alternate energy supply and prevention of vegetation loss is a challenge that the various relevant legislations need to address.

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)
Microorganisms	Commercial use	Y
Microorganisms	Research	N
Invertebrates	Commercial use	Y
Invertebrates	Research	N
vertebrates	Commercial use	Y
vertebrates	Research	N
Wild and cultivated terrestrial and aquatic plants other than crops and crop wild relatives	Commercial use	Y
Wild and cultivated terrestrial and aquatic plants other than crops and crop wild relatives	Research	N

Add row

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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.**

Ethiopia has been exercising ABS since it has established the institutional and legal framework. Ethiopia has established the Ethiopian Biodiversity Institute as Competent National Authority, signed Convention on Biological diversity. Furthermore, Ethiopia has ratified the Nagoya Protocol on Access and Benefit Sharing and put in place domestic legislation to facilitate access to its genetic resources and ensure fair and equitable benefit sharing.
Though the benefit sharing component of ABS agreements signed on tef (Eragrotis tef) and Vernonia (Vernonia galemensis) have never been properly implemented, recently Ethiopia signed agreement with a private USA based company on access and benefit sharing from the use of Dichrostachys cinerea, Osyris quadripartitum and Withania somnifera species for the purpose of producing essential oils, cosmetics and herbal medicine. From the agreement, Ethiopia earned an upfront payment and the agreement stipulates that the benefits accrued from the access of the above genetic resources will be shared equitably between the company and the local communities/the government of Ethiopia. The benefits are incentives to the local communities/ government to conserve and sustainably utilize biodiversity.
Moreover, local companies that were using different genetic resources such as Aloe and Moringa stenopetala species for various commercial purposes came into legal agreements with EBI for the use of the genetic materials in a way that the agreements enable income generation for the companies as well as the local communities and sustainably utilize the resources base.
Despite progresses in exercising ABS measures, unavailability of information on the value of genetic resources at national level,

inadequate awareness on access and benefit sharing, lack of strong cooperation and links between the ABS focal point (EBI) and the various organizations having responsibilities for different aspects of genetic resources, lack of trained man power in negotiating agreements that have an international nature and research on value of biological resources were identified gaps identified in the course of the agreement processes and non compliance by user countries to contractual agreements are some of the problems in the proper implementation of ABS measures in Ethiopia.

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 ministry of agriculture is responsible to lead all development aspects of agriculture, particularly crop and animal agriculture. The aspect of natural resources conservation (including forest and soil resources) is also under the same Ministry. The Ministry's information hub (the web site) provides information on all aspects, save microorganisms, of the various sectors. There is a new Ministry for environment and forest and there is need to link the information systems of the two Ministries which basically deal with biodiversity. The periodic information generated by the Central Statistical Agency creates a means to link information on the various sectors. The information system aligned with the clearing house mechanism and which is housed at the Ethiopian Biodiversity Institute, despite problems with its full functionality and inadequate awareness on the part of potential users, is an important source on biodiversity for food and agriculture.

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
There is no information system which is dedicated to associated diversity.		

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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.

See in the attached document

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.**

Ethiopian Biodiversity Institute is mandated for the conservation and sustainable utilization of all forms of biological resources of Ethiopia, namely: plants, animals and microbial genetic resources and their respective ecosystems as well as associated community knowledge and equitable sharing of benefits accrued from the access of the country's biological resources. Other major actors engaged in such activities are Ministry of Agriculture, Ethiopian Institute of Agricultural Research, Ethiopian Wildlife Conservation Authority, Ministry Environment and Forest (the then EPA), Higher Learning Institutions, Ministry of Culture and Tourism, Regional Bureaus of Agriculture and recently established Biodiversity offices , Environment and Forest as well as Forest and Wildlife, and Pastoral Agencies of the national regional states. The activities of these are financed by the budgets allocated from the federal and regional governments. Besides, there are several international, regional and local NGOs that are

involved in biodiversity related activities in Ethiopia. In addition, local communities (farmers, pastoralists and others) are among the major stakeholders in the conservation of biodiversity for food and agriculture.

With regard to scope, objectives and activities of some relevant stakeholders in relation to biodiversity for food and agriculture:

(i) Local Communities:
Being the custodian of Ethiopian biodiversity, access and benefit sharing legislation gives local communities are responsible to give PIC to access community knowledge related to genetic resources. Moreover, they are empowered to regulate genetic resources in their localities. They can prohibit any person, who does not belong to their communities, from collecting or taking genetic resources without having the necessary permit.

(ii) Responsibilities of Regional Bodies: Local administrations and regional bodies at all levels who are responsible for the conservation of genetic resources are empowered to:
 regulate that genetic resources is not accessed from their respective jurisdiction without permit by any person who does not belong to the communities thereof; and
 require access permit from any person, who does not belong to the communities thereof and who is collecting or taking genetic resources from their respective jurisdiction, and if he is without permit, seize the genetic resource and present him to the law and notify the
IBC the detailed particulars of the genetic resource and the person found in possession.

(iii) Ethiopian Revenue and Customs Authority: The Proclamation on ABS empowered custom offices to regulate transfer of any genetic resources being taken out of the country. It is responsible to seize genetic resources being transported out of the country and the person transporting them without permit.

(iv). Institutions involved in Mail Service : Postal and other courier service institutions are also responsible to require their clients to show permit before receiving and transporting genetic resources out of the country as mail.

(v) Ministry of Agriculture: The Plant and Animal Health and Regulatory Directorate under the Ministry is responsible to regulate plant and animal health of imported and exported genetic resources to protect the country's biodiversity from invasive pests and diseases. Based on a pre-import evaluation, the Directorate issue import permit. The Ministry is empowered to ensure that the quarantine certificate they issue to export genetic resource products, contain a statement indicating that the certificate does not constitute a permit to use the product as genetic resource and that doing so is prohibited and would constitute an offence. It also prohibits or restricts the importation of living plants, plant parts, and seeds for planting. It ensures that they are aware of the quarantine status of the organisms they accept into and store in their collections. The organization provides lists of controlled organisms' exotic species.

Though there are several stakeholders (institutions, researchers, policy makers and public) working on biodiversity conservation and sustainable utilization, they fail to make tangible impact on minimizing biodiversity loss as a result of low level of interaction and coordination among them. However, the country is making huge efforts to raise awareness of stakeholders and to work in collaboration, including the public in areas of biodiversity conservation, sustainable utilization and development.

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.**

Ethiopia has put in place domestic legislation to facilitate access to its genetic resources and ensure fair and equitable benefit sharing. Furthermore, Ethiopia has acceded to the Nagoya Protocol and developed Code of Conduct to administer the ABS issues. The recently signed agreement between EBI and a private USA based company on access and benefit sharing from the use of Dichrostachys cinerea, Osyris quadripartitum and Withania somnifera species for the purpose of producing essential oils, cosmetics and herbal medicine is a notable example. From the agreement, Ethiopia earned an upfront payment and the agreement stipulates that the benefits accrued from the access of the above genetic resources will be shared equitably between the company and the local communities/the government of Ethiopia. The benefits are incentives to the local communities/ government to conserve and sustainably utilize biodiversity. Moreover, local companies that were using different genetic resources such as Aloe and Moringa stenopetala species for various commercial purposes came into legal agreements with EBI for the use of the genetic materials in a way that the agreements enable income generation for the companies as well as the local communities and sustainably utilize the resources base. In addition, the earnings from accessed genetic resources have been used to fund/support research projects on biodiversity for food and agriculture. The projects funded are Promoting Conservation and Sustainable Utilization of Biodiversity Resources in SNNP Regional State, Environmental Protection for Genetic Resources Conservation, Managing & Conserving Genetic Resources and Associated Community Knowledge.

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.

There are projects working on the conservation and sustainable use of biodiversity for food and agriculture, and indirectly on associated biodiversity and/or wild foods in the country. Among these, the major ones are:
1. Conservation, Sustainable Utilization and Access and benefit Sharing of Medicinal Plants Project (Naturally regenerated forests: tropics, Planted forests: tropics & Mixed system: tropics)
2. Mainstreaming Agro-biodiversity into the Production Systems of Ethiopia Project (Mixed system: tropics; Naturally regenerated forests: tropics)
3. PR 80/81-Maintaining and Establishing the Community Gene Banks and Primitive Landrace Conservation (Mixed system: tropics)
4. Community Based Integrated Natural resource Management Project (CBINReMP) (Naturally regenerated forests: tropics & Mixed system: tropics)
5. EAPGREN- Eastern Africa Plant Genetic Resources Network

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)
Sustainable Land Management Project 1(SLMP 1)	Sustainable Land Management Project 1(SLMP 1) was launched in 2008 with prime objective of reducing land degradation in agricultural landscapes and improving the agricultural productivity of smallholder farmers. The main project components were watershed management (scaling up best practices), land certification (strengthening land tenure) and project management (knowledge management). The project has successfully introduced land management practices and rehabilitated thousands of hectares of degraded lands using physical and biological measures.	45 selected watersheds
Sustainable Land Management Project 2 (SLMP 2)	The SLMP II has started in 2013 and aims to reduce land degradation and improve land productivity of smallholder farmers through the provision of capital investments, technical assistance and capacity building at national and sub-national levels. The SLMP II is build on the results of SLMP I and also introduces measures to address climate change/variability related risks and to maximize Green House Gas (GHG) emission reductions so as to meet the GTP and the CRGE goals. The results of the project will be measured by the total land area to be put under sustainable and climate resilient land management practices and amount of total carbon sequestered per unit area and time. The SLMP II is being implemented in 90 new and 45 existing Woredas/watersheds in six of the regions such as Oromia, Amhara, Tigray, SNNP, Gambela and Benishangul Gumuz.	90 new and 45 existing watersheds

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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.**

Climate Resilient Green Economy (CRGE) strategy

Ethiopia has devised CRGE strategy which will allow a green growth path and fosters development and sustainability. The CRGE initiative follows a sectoral approach, and as part of the strategy, the government has selected four initiatives, namely: exploiting the vast hydropower potential; large-scale promotion of advanced rural cooking technologies; efficiency improvements to the livestock value chain; and Reducing Emissions from Deforestation and Forest Degradation (REDD) as the best chances of promoting growth immediately, capturing large abatement potentials, and attracting climate finance for their implementation.

Growth and Transformation Plan (GTP)
The GTP (2011-2015) recognizes that environment is a vital pillar of sustainable development, and among the key strategic directions to be pursued during the plan period are building a Green Economy and implementation of ongoing environmental laws. In the Plan, issues of biodiversity are mainstreamed mainly through agriculture and tourism sectors. In the Plan period, the Ministry of Agriculture has planned activities that enhance biodiversity restoration. These include, among others, preparation of land use guidelines, rehabilitation of degraded areas, increased community based natural resource conservation, increased coverage of protected forest and land covered with multipurpose trees.

National Biodiversity Strategy and Action Plan
The revised NBSAP provides a comprehensive account of the country's biodiversity; identifies threats to biodiversity; describes achievements accomplished so far and gaps in conservation and sustainable use of biodiversity. It sets out vision, mission, principles, strategic goals and national targets and their corresponding actions of the revised strategy and outlines implementation arrangement. The targets and their corresponding actions of the revised strategic document take into consideration concerns in terms of conservation, sustainable use of biodiversity and ecosystem components and equitable sharing of benefits accrued from their use. The revised strategy will be implemented in collaboration and partnership with all relevant stakeholders.

Standing committees on Natural Resource and Environmental Affairs
(House of Representatives)
The Standing Committees on Natural Resource and Environmental Affairs in the House of Representatives oversee planned activities and implementation of natural resource and environment related issues in the country. They also facilitate inter-sector collaborations.

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?**

Ethiopian Government has put in place policies and strategies for sustainable natural resource management, including biodiversity conservation and sustainable development. The country is taking various measures to mainstream biodiversity into sectoral and cross-sectoral plans and programs. Devising and implementation of Climate Resilient Green Economy Strategy is one of the major recent steps geared towards successful mainstreaming of biodiversity into agriculture, forest, power and transport. Moreover, biodiversity issues are mainstreamed into different sectors such as tourism, education and energy (EBI, 2014a, 2014b).

Institutional frameworks will also help to effectively implement conservation, sustainable use and development of biodiversity, and ensure fair and equitable sharing of benefits accrued from access of the country's genetic resources. Ethiopia has established and restructured some institutions at federal and national regional states. These include re-establishment and restructuring of Ethiopian Biodiversity Institute, establishments of Regional Biodiversity Units, Biodiversity centers and Ministry of Environment and Forest (EBI, 2014a; 2014b).

The major strategy designed by Ethiopia for the effective achievement of Aichi targets is mainstreaming Biodiversity in all sectors and establishment of Institutional frameworks. This will help the country to effectively implement conservation, sustainable use and development of biodiversity, and ensure fair and equitable sharing of benefits accrued from access of the country's genetic resources (EBI, 2014a, 2014b).

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?**

Development of Ethiopia's National Biodiversity Targets and actions have been based on the analysis of the existing realities of the country such as level of threats, government priorities, existing capacity, lessons from the hitherto implementation exper

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
Saving the Threatened Endemic Birds of Southern Ethiopia	International	An NGO (Wild life & Natural History Society of Ethiopia) is working on endangered bird species in collaboration with Bird Life International on the project entitled: "Saving the Threatened Endemic Birds of Southern Ethiopia" in Borana & Guji Zones of the Oromia Region.	EWNHS

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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?**

There are no specific trainings and extension programes targeting conservation and sustainable use of associated biodiversity. However, through environment and natural resources management extension programs, established biodiversity units at national regional state levels, and through media coverage, conservation and sustainable use of associated biodiversity is being promoted.

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)
Addis Ababa University	Plant Biology and Biodiversity Management	Postgraduate	25	24	1
Addis Ababa University	Applied Microbiology	Postgraduate	NK	NK	NK
Addis Ababa University	Fisheries and Aquatic Science	Postgraduate	NK	NK	NK
Bahir Dar university	Fisheries and Wetland Management	Postgraduate	NK	NK	NK
Hawassa University Wondo Genet College of Forestry & Natural Resources	Wildlife, Wetland and Fishery Management	Postgraduate	NK	NK	NK
Hawassa University Wondo Genet College of Forestry & Natural Resources	Biodiversity Conservation and Management	Postgraduate	11	8	3
Hawassa University	Applied Microbiology	Postgraduate			

Institution	Programme	Level	Enrolment (total)	Enrolment (male)	Enrolment (female)
Dilla University	Geography and Environmental Studies (Specialization: Sustainable Natural Resource Management)	Postgraduate	NK	NK	NK
Haramaya University	Natural Resource Management and Environmental Science	Postgraduate	2	0	2
Ambo University	Aqua-culture and Fisheries	Postgraduate	NK	NK	NK
Hawassa University College of Agriculture	Animal and Range Science	Postgraduate	NK	NK	NK
Hawassa University	Integrated Water shed Management	Postgraduate	22	16	6
Jimma University	Natural Resources Management	Postgraduate	34	31	3

Add row

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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.

Ethiopian Biodiversity Institute
• Ethiopian Biodiversity Institute is mandated for the conservation and sustainable utilization of all forms of biological resources of Ethiopia, namely: plants, animals and microbial genetic resources and their respective ecosystems as well as associated community knowledge and equitable sharing of benefits accrued from the access of the country's biological resources. There are 79 active researchers who are engaged in research work on biodiversity for food and agriculture.

EWCA conducts research relevant to conservation and sustainable utilization of wild life

Ethiopian Institute of Agricultural Research
• The Ethiopian Institute of Agricultural Research (EIAR) is responsible for research in crops, livestock and agricultural mechanization at federal level.
National Soil Testing Center
• The National Soil Testing Centre under the Ministry of Agriculture carries out various activities related to soil, such as soil chemistry, soil physics, soil fertility, soil biology (microbial composition) tests and soil mapping and database management.

Holeta Bee Research Center
• The research center coordinates national research on apiculture and also addresses pollination services
Higher Learning Institutions
o Apart from the academics, higher learning institutes carry out research and development aspect of associated biodiversities in Ethiopia. Various departments (Entomology, Applied Microbiology, etc) have been organized and strengthened to undertake researches on associated biodiversity.

Regional agricultural Research Institutes (RARIs)
• The Regional Agricultural Research Institutes are responsible for research in crops, livestock and agricultural mechanization at regional level.
NGOs (e.g., Nature and Biodiversity Conservation Union (NABU), Melca-Ethiopia, Ethiopian Wild Life and Natural History Society (EWNHS))

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?**

a. What are the major gaps in information and knowledge?
-Lack of adequate information system on aspects of biodiversity
-There is a gap in the flow of information and use of it among sectors and stakeholders.

b. What are the main capacity or resources limitations?
-Inadequate financial resources limit the establishment of information system and extent of flow of information among institutions.
-There are resources limitations (human and material) to address gaps in research and development of biodiversity for food and agriculture.

c. What are the main policy and institutional constraints?
-There are no limitations with regard to institutional establishments and policies. However, implementation of policies is fraught with problems which include lack of integration among institutions.

d. What actions are required and what would be the priorities?
-Develop and efficiently implement information exchange system among institutions.
-Integrate actions of different institutions in the implementation of biodiversity related issues.
-Secure financial resources to support research on conservation and use of biodiversity for food and agriculture and increase provision of ecosystem services.

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?**

See in the attached document

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?**

See in the attached document

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?**

See in the attached document

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.

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.

Extensive natural resource conservation activities which have implication on the conservation and sustainable use of biodiversity for food and agriculture are being implemented in the country. A specific plan has also been developed in a form of National Biodiversity Strategy and Action Plan (NBSAP) which addresses conservation, sustainable use and access and benefit sharing aspects of biodiversity. A total of 18 prior targets have been identified for implementation within the years 2015 to 2020. All the targets are related to the Aichi targets and address issues of improving food security, rural livelihoods, productivity and sustainability and resilience of production systems have been directly or indirectly addressed in the action plan. Similarly, supporting ecosystem function and the provision of services, and sustainable intensification have also been considered. While Ethiopian biodiversity Institute plays the leading role, the contribution of various stakeholders (community, research, development and higher learning institutions, and NGOs) has been indicated in the strategy and action plan. The state and trends of biodiversity have been seen to be declining and this aspect has been addressed in the strategy and action plan through setting targets in terms of capacity building, financial resourcing, addressing policy gaps, awareness creation at all levels, ensuring involvement and integration of stakeholders, improve in database and information dissemination, promotion of use of biodiversity for food and agriculture through research, and strengthening in situ and ex situ actions. There is no specific plan to address associated biodiversity but the ecosystem approach and services considered in the plan imply that associated biodiversity has been addressed directly or indirectly. Target two and three of the national strategy and action plan indicate biodiversity issues will be mainstreamed in policies and strategies and policy gaps will be addressed after reviewing the existing ones. This process provides opportunity to give due attention to addressing the particulars of associated biodiversity in policy formulation. Establishment of a national council which gives overall guidance to biodiversity conservation, sustainable utilization and access and benefit sharing has been indicated in the national strategy and action plan and this would facilitate the collaboration among and integration of actions of various stakeholders. The valuation of biodiversity is one of the most important areas to prioritize and promote conservation, sustainable utilization and access and benefit sharing. Research to address information and knowledge gap in this regard has been included as target sixteen of the national strategy and action plan. The UN strategy plan has been incorporated into the national strategy and action plan through adoption of all, save target 10 which deals with marine ecosystem, Aichi targets. Aichi targets 6, 7 and 13 have been addressed grossly in all the 18 national targets of the national strategy and action plan. Some of the targets address other related processes undertaken through the Convention on Biological Diversity (e.g. Target 17 of NBSAP deals with issues of addressing international legislations).

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.**

In order to improve the capacity of institutions concerned with the maintenance and use of biodiversity for food and agriculture and other related resources, Ethiopia has developed the CRGE, GTP, and other sectoral & cross sectoral development strategies, programs and action plans incorporating targets & actions of NBSAP. The first way and means of addressing this issue is raising awareness at all levels & improving collaboration between stakeholders & capacity building in education & skill, information technology & exchange & in other related disciplines. Actions that strengthen conservation and sustainable use of agro-biodiversity, wild plants and animals, and microbes particularly; endemic, endangered, economically or ecologically important species will be undertaken to meet the objective of the proposed targets in this regard. These include assessment of crops and wild plants, domestic and wild animals, and microbes and subsequent collection of germplasm, herbarium and animal specimen; improving management conditions of the existing and establishment of new ex situ conservation sites with full participation of local communities. In addition, the lead institute, EBI, has signed memorandum of understanding (MoU) with several universities to mainstream biodiversity into their curricula and research and with regions, weredas and rural communities with regard to the conservation of the resource base. The collaboration of stakeholders (GOs, NGOs, Research & Higher learning Institutions, the private sector and the community at large) will be strengthened further based on the action plan of the future endeavors on research, conservation, development, sustainable utilization and the overall management of biodiversity & in other capacity building activities.

Lack of harmonization of laws, regulations and strategies, perverse incentives and absence of regulations in some areas of biodiversity (e.g. associated biodiversity, wild foods, etc) have resulted in loss of genetic resources. Therefore, there is a need to review and fill the gaps of the existing laws, regulations and strategies, and formulate new ones as necessary. Moreover, there is a need for capacity building that will enable the enforcement of the existing ones. So as to the future target of Ethiopia, identifying and filling the gaps in the existing laws, legislations and strategies, including those associated with the incentives related to biodiversity for food and agriculture and formulating new ones are among the ways & means to address the policy issues relevant to associated biodiversity & wild foods. In addition, mainstreaming of the revised and/or formulated laws, regulations and strategies is another crucially important part of the NBSAP for the realization of this target.

Weak information exchange mechanism and strategy among the national stakeholders is affecting the efforts to , monitor and sustainably utilize the biodiversity for food and agriculture including associated biodiversity & wild food resources of Ethiopia. Thus, ensuring availability of information and knowledge for action, including through updating of Clearing House Mechanism (CHM) can help to strengthen information exchange and integration of biodiversity issues to the broader national strategies.

Participatory stakeholder involvement throughout the design, planning and implementation of the conservation & sustainable utilization of biodiversity resources for food & agriculture in general (including associated biodiversity wild foods) is essential to ensure that the plans will be effectively communicated and implemented at the grassroots levels. Thus, updating of the existing CHM, creating a strong national data base, and effective national and regional clearing house mechanism (CHM) strategies and actions are the key instruments to strengthen information exchange and reach major stakeholders both at national and international levels.

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

In addition to institutions which are in one way or the other involved in activities which contribute to implementing ecosystem approach the National Biodiversity Strategy and Action plan envisages implementation of ecosystem approach and deals with biodiversity from ecosystem, species and genetic diversity perspective. Of the 18 national targets, 8 directly refer to ecosystem or ecosystem services while the others are indirectly related to ecosystem services.

Implementation of ecosystem approaches in forms of biosphere reserves, protected areas (PAs), area closures, sustainable forest management, integrated watershed development are being implemented and are likely to continue as priorities in the future since there is strong policy support and public commitment in this regard. These ecosystem approaches undoubtedly contribute to conservation and use of components of biodiversity for and agriculture

Improving stakeholder involvement and awareness

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

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

See in the attached document

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.**

Farmers, pastoralists, fisher folk, forest dwellers, and other rural men and women are well aware of direct uses of biodiversity, but not values of most ecosystem services. This calls for educating the community and increase their awareness on the diverse values of biodiversity which will increase community's participation to protect it and use it sustainably. For this there is a plan to conduct public awareness campaigns about biodiversity and the steps people can take to protect it through information dissemination using mass media, making awareness creation part of the agricultural extension system and organizing events to local communities to exchange experiences and share information.

Over-utilization of biological resources is one of the major threats to biodiversity in Ethiopia, contributing to degradation of rangelands, forest, wetland and aquatic ecosystems. Therefore, sustainable management of biodiversity is required to acquire benefits and ensure sustainable livelihoods of local communities engaged in the use of local natural resources. To achieve this there is a planned action to reduce overexploitation through measures such as development and implementation of regulations and guidelines to control open access to grazing lands, aquatic ecosystems, wetlands and other communal lands, and promotion of afforestation and use of non-wood forest products.

Maintaining ecosystems helps to ensure the continuation of existing ecosystem services, including carbon sequestration. Restored ecosystems can improve resilience including their adaptive capacity, and can contribute to climate change adaptation and generate additional benefits for the people, in particular local communities. Increasing forest cover, designation of wetlands and restoration of degraded areas are the major activities required to realize this target. Participatory Forest Management which is underway in different parts of the country will be strengthened through 2020. Moreover, climate change mitigation activities such as Carbon Trade and CRGE strategy will be widely implemented which will help to generate incentives for the local communities who have role in the conservation of the resource.

Smallholders and pastoralists are custodians of biodiversity. Finding niche markets for selected species and their products is one possible way of ensuring the sustainable utilization of biodiversity and benefit people who participate in conservation of the resource. These can be achieved through searching local, national and international markets, enhancing information on the marketing channels to increase the value of genetic resources and devising ways to develop specialty markets. Although value addition and finding niche markets have been initiated for some biodiversity products, most conservators have not yet been benefited. Thus there is a plan to increase benefits from biodiversity through value addition for selected agricultural products and to create market links.

There is lack of interest by many stakeholders to engage local communities to make real participation in initiatives in their locality concerning conservation and use of biodiversity apart from sporadic consultation at project/programme initiation phases. These, together with the poor institutional set ups results in slow improvements in arresting the drivers. To change this scenario there is a plan to strengthen stakeholders' integration, including the participation of local communities in biodiversity conservation and sustainable utilization through establishing Biodiversity Units at national regional state levels, and establishing Biodiversity Centers at ecologically representative areas of the country.

Ethiopia is a country having a society of highly diverse traditions. Through their interaction with diversified biophysical environments these societies have developed their own knowledge on conservation and use of biodiversity including their use in coping mechanisms in times of difficulties (eg. drought). But very few of the knowledge of these societies have been documented and used in national development and poverty alleviation strategies. Therefore, further efforts are required to document the knowledge, innovations and practices of local communities of the country that are relevant for conservation,

sustainable utilization and development of biodiversity, and their customary use of biological resources. Moreover, integrating these community knowledge, innovation and practice into the national development and poverty alleviation strategies, with the full and effective participation of local communities, is required for effective conservation, sustainable utilization and development of the country's biodiversity. Actions planned to achieve this include reviewing, documenting and communicating existing knowledge, innovations and practices of local communities relevant to conservation and sustainable utilization of biodiversity and integrating the knowledge, innovations and practices of local communities relevant to conservation and sustainable utilization of biodiversity into national and local development and poverty alleviation strategies.

Due to limited capacity and lack of effective enforcement and follow up mechanisms of the ABS, the country and local communities are not benefiting from accessing their genetic resources. This has contributed to the degradation of the country's biodiversity. Therefore, concerted efforts are required to maximize access of potential genetic materials and sharing benefits accrued from their use equitably. To achieve this there is a plan to build capacity for bio-prospecting and negotiation, and increase the number of bio-prospected species/products and community knowledge.

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.**

contribution to conservation and sustainable use of biodiversity are the main actions that need to be taken to ensure women's access to and equitable control over biodiversity resources. This will require establishing and strengthening of networks to promote gender mainstreaming within biodiversity conservation and sustainable use (EBI, 2014b). Specific action planed to improve the contribution of women to the conservation and use of the different components of biodiversity for food and agriculture include: generation of baseline data on the level of women's access to and use of biodiversity resources, preparation and implementation of guidelines and regulations, to promote gender awareness and increase the involvement of women in the conservation and use of the different components of biodiversity for food and agriculture, developing and implementing national gender mainstreaming guideline on biodiversity resources and ecosystem services, and conducting value addition activities for agricultural products and create market links taking in to account the needs of women.

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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 Subtropics Temperate Boreal and /or highlands[1]	Systems in which the animals obtain a large proportion of their forage intake by grazing natural or sown pastures, includes: • Ranching: grassland-based systems in which livestock is kept on privately owned rangeland • Pastoralist: grassland-based systems in which the livestock keepers move with their herds or flocks in an opportunistic way on communal land to find feed and water for their animals (either from or not from a fixed home base)
Livestock landless systems	Tropics	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.

Q. 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.

Pollination

The dependence of the tropical livestock grassland based, the livestock land less system and Self- recruiting capture fisheries, on pollination is not significant and it appears that the various drivers have very minimal effect, if any, on these production systems. In naturally regenerated forests change in land and water use and management, overexploitation and overharvesting are causing loss of these forests. As a result of habitat destruction there is significant effect on pollinators and pollination as ecosystem service. Arthropod and avian pollinators are likely to be involved but work to quantify the effects has not been undertaken and indicators have not been used.

With regard to planted forests changes in land and water use and management and policies have positive effect. Strong policy support and implementation of afforestation activities are being undertaken in the country and this is providing good habitat to pollinators. In the northern part of Ethiopia afforested areas are becoming important honey bee keeping areas, where the bees would serve as important pollinators. Here also no study has been undertaken and other than bees there is no information on other pollinators and indicators have not been used. Alien invasive species which are affecting planted forests can have negative effect on the pollinators, particularly the indigenous ones. In irrigated crop production systems pollution and external inputs, pests, diseases and alien invasive species have negative effect on pollination as a result of their effect on pollinators. Amsalu et al (2012) have quantified the effect of chemicals to cause as high as 100% mortality of honey bees and mortality rate of honey bees from various chemicals has been used as an indicator.

In the Mixed system Changes in land and water use and management; pollution and external inputs, Pests, diseases, alien invasive species are likely to have negative effect on pollination. Increasing amount of land is being turned into agriculture and use of chemicals and external inputs to both crop and livestock production are on the rise. In addition to that invasive alien species are becoming a threat in mixed system. All these play significant loss of pollinators as a result of habitat destruction and direct effect on them, with subsequent effect on pollination. Studies to quantify the effect are lacking and no indicators have been used.

Pest and disease Regulation

Ecosystem service of pest and disease regulation in grassland based livestock system is positively affected by policies and advancement and innovations in science and technology. Because of the fact that the bulk of livestock trade comes from this system policies which favor quarantine and zoo-sanitary practices have been enacted and have, along with advancement and innovations in science, significant positive effect on the ecosystem service. On the other hand pests, disease and alien invasive species have a direct negative effect.

In the livestock landless system policies, changing economic, socio-political, and cultural factors, advancement and innovations in science and technology have positive effect on pest and disease regulation as ecosystem services, while pest, disease and alien invasive species, population growth and urbanization have negative effect.

In naturally regenerated and planted forests, pests, diseases and alien invasive species have negative effect on pest and disease regulation service of this ecosystem while policy has positive effect. There appears that alien invasive species, particularly *Prosopis juliflora* is invading naturally regenerating and planted forest areas mainly those in drier areas of the country. As a result ecosystem disturbance occurs leading to reduction in pest and disease regulation service by the system. Policies are in place which favor control of invasive alien species and contribute to healthy naturally regenerated and planted forest ecosystem and thereby to pest and disease regulation. Similarly in self recruiting capture fisheries system pests diseases, alien invasive species have negative effect while policies, and advancements and innovations in science and technology have positive effect. Water hyacinth has caused serious problem on fish resources in some lakes including Lake Tana (Rezene, 2012).

In irrigated crops (including rice), and mixed systems pollution and external inputs; pests, diseases, alien invasive species have negative effect while, advancements and innovations in science and technology have positive effect. Increased use of inorganic fertilizers and pesticides expansion of alien invasive species causes in reduction of ecosystem service provided in the form of pest and disease regulation. There are advancements and innovations in science and technology which contribute positively to control weeds (invasive alien species) which are safe to the environment at the same time (Amssalu et al., 2012), as result can have positive contribution in pest and disease regulation in both irrigated crops and mixed systems.

Water purification and waste treatment

In the Livestock grassland based system water purification and waste treatment as an ecosystem service is mainly a function of the vegetation and the soil cover. Overexploitation and overharvesting mainly in a form of overgrazing, population growth and urbanization would result in vegetation and soil cover reduction and loss and have negative effect on water purification and waste treatment. Current policies support proper management of the land while

advancements and innovations in science and technology provide the options (e.g. fire management) to control vegetation loss thereby improving water purification and waste treatment

In the livestock land less system due to its intensive nature increased use of external inputs including chemicals and accumulation of waste is common as a result these affects water purification and waste management negatively. The advancements and innovations in science and technology which improve waste management and produce less harming chemicals have positive contribution in water purification and waste management in the livestock landless system.

In the naturally regenerated and planted forests systems also changes in land and water use and management are harming the vegetation cover thereby affecting the contribution of this system to water purification and waste management. Similar effect is seen by overexploitation and overharvesting in naturally regenerated forests. Policies are available which contribute to conservation of natural resources (forest and soil) and plantation of trees and as a result positively contribute to increased water purification and waste management in both systems.

Changes in land and water use and management in catchments, and pollution and external inputs are causing significant damage to water bodies. Due to this the water purification and waste management service of self recruiting capture fisheries system is highly affected in a negative way. Advancements and innovations in science and technology which contribute to development of less harmful or easily degradable chemicals can positively contribute to the water purification and waste management service of this system.

In the irrigated crops (including rice) and mixed system pollution from use of chemicals and increased use of external inputs such as inorganic fertilizers causes negative effect on water purification and waste management service. In addition to that change in land and water use and management in a form of turning more land into crop can also have negative effect.

Natural Hazard regulation

Change in land and water use and management, overexploitation and overharvesting, climate change, natural disasters have negative effect on natural hazard regulation in livestock grassland based system. Harm to vegetation from these drivers can reduce water percolation and cause flooding. In naturally regenerated and planted forests overexploitation and overharvesting, and natural disasters have negative effects while changing economic, socio-political and cultural factors have positive effect in naturally regenerated forests and negative effect, in planted forests, on natural hazard regulation.

In self recruiting capture fisheries the changes occurring in land and water use and management, and overexploitation and overharvesting, have negative effect on natural hazard regulation in this system while policies which are

favorable to land and water use and management and in curbing overexploitation and overharvesting have positive effect.

In irrigated crops (including rice) natural disasters have negative effect while changes in land and water use and management and policies have positive effect on natural hazard regulation. In the mixed system changes in land and water use and management, overexploitation and over harvesting, pests, diseases and alien invasive species have negative effect on natural hazard regulation while policies which favor preventive actions and preparedness and advancements and innovations in science and technology which contribute to development of adaptive technologies have positive effect.

Nutrient cycling

In the livestock grassland based, naturally regenerated and planted forests, and irrigated crops (including rice) systems overexploitation and overharvesting have negative effect on nutrient cycling while policies have positive effect. Pollution and external inputs as drivers of nutrient cycling ecosystem service have negative effect on the livestock grassland based, self recruiting capture fisheries and mixed systems. Change in land and water use and management also affects nutrient cycling in naturally regenerated and planted forests, self recruiting capture fisheries, and mixed system through loss of vegetation cover, increased run off and/or excessive mining from water bodies.

Soil formation and protection

In the livestock grassland based, naturally regenerated forests, and irrigated crops system change in land and water use and management, have significant effect in soil formation and protection through the influence they have on vegetation cover, water runoff and soil erosion. Overexploitation and overharvesting have negative effect on soil formation and protection through increased erosion and excessive mining in the livestock grassland based, naturally regenerated and planted forests, irrigated crops and mixed systems. Change in land and water use and management plays positive role in soil formation and protection in the irrigated crops system, through balanced release of water and provision of moisture for decomposition to take place. Policies that favor protection of natural resources have positive contribution in soil formation and protection in naturally regenerated and planted forests and mixed systems.

Water cycling

Change in land and water use and management which is taking place in relation to plantations in the livestock grassland based, naturally regenerated and planted forests systems have positive effect on water cycling, while over exploitation and overharvesting as related to overgrazing of the pastoral areas and natural disaster play negative role in water cycling in the livestock grassland based and mixed system. Pollution and external inputs and population growth and urbanization have negative effect on water cycling in self recruiting capture fishery system. Policies which favor protection of natural

resources and water percolation have positive effect on water cycling in planted forests, irrigated crops and mixed systems.

Provisioning of Habitat

The change in land and water use and management that is taking place in livestock grassland based system along with policies contributes to provisioning of habitats to birds and aquatic animals (e.g. construction of dams). Change in land and water use and management in naturally regenerated forests, self recruiting capture fisheries and mixed systems have negative effect on provisioning of habitat. Policies and advancements and innovations in science and technology have positive effect in improving protection of the natural resource which would then ensure the realization of habitat provisioning. Overexploitation and overharvesting have negative effect on habitat provisioning in naturally regenerated and planted forests, irrigated crops and mixed systems.

Production of oxygen/gas regulation

In terrestrial systems production of oxygen and gas regulation are mainly functions of vegetation. In the livestock grassland based and irrigated crops (including rice) system the changes that are taking place in land and water use and management have negative effect on production of oxygen/ gas regulation. That happens because of loss of vegetation. In aquatic systems as a result of existence of invasive alien species (e.g. water hyacinth) and pollution, production of oxygen/gas regulation in the self recruiting capture fisheries is negatively affected. Invasive alien species, mainly *Prosopis juliflora*, in livestock grassland based system has positive contribution to oxygen/gas regulation because of increased canopy and vegetation cover. Policies which guided the extensive afforestation program contribute to production of oxygen/ gas regulation in self regenerated and planted forests. Climate change and natural disaster have negative effect on production of oxygen/ gas regulation in mixed system.

Q. 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.

Livestock grassland-based production systems:

Because of the influence of natural and anthropogenic factors, and inefficient and unsustainable management, the stability of Livestock grassland-based production systems is declining in extent and degrading in diversity from time to time. Invasive sp are among the major threats to the system. Through invading the range and pasture lands, the species are imposing a severe threat on the habitat and its biodiversity resources (Rezene Fessehaie et al., 2012). As a result, there is a decreasing trend in the extent of productive land and decline

and loss in the diversity of palatable sp. This has directly affected the livestock, the flora & fauna, and the microbial components in particular and the overall ecosystem in general. This in turn, is negatively impacting the associated biodiversity and ecosystem services. Though the impact of changes on ecosystem services like pollination and pest and disease regulation are not known currently, the decreasing trend in extent & diversity of the production system is negatively affecting all the other ecosystem services.

Livestock landless systems:

The system is dominantly found in urban and peri-urban areas. It is characterized by intensive, market oriented small to large scale dairy and poultry production, with exotic genotypes and their crosses. Since the system is oriented on livestock husbandry without pasture or grazing land, the production is carried out on the basis of provision of feed and forage through cut & carry system and/or purchase of inputs. So, it is assumed that changes within the production system are not applicable to impact the regulating and supporting ecosystem services.

Naturally regenerated forests:

Climate change, fire hazard, invasive species, human encroachment for wood and non wood products coupled with selective exploitation and livestock pressure on the naturally regenerated forests have contributed to the decrease in extent and to the decline and genetic erosion of the resource base. The forest resource assessment recently conducted in the country shows that, between 1990 and 2010, Ethiopia lost an average of 140,900 ha or 0.93% per year. In total, between 1990 and 2010, the country lost 18.6% of its forest cover or around 2,818,000 ha (FAO, FRA, 2010). This decreasing trend in extent has resulted in the decrease and loss of genetic resources. In addition, lack of sustainable management of the production system has severely aggravated the decline and degradation of biodiversity resources and the associated ecosystem services. As a result of the decreasing trend in extent and diversity of the production system, all ecosystem services are more or less equally impacted negatively, except the regulation of pest and disease, on which the impact of change within the naturally regenerated forests is not known currently because of lack of documented data and information.

Planted forests:

According to FAO, currently Ethiopia has 511,000 ha of planted forest, with more than 4.5% coverage of the total land area. This shows an increasing trend of the extent of planted forests in the country. The coverage of planted forests in the year 2005 was 491,000 ha, this figure had increased to 511,000 ha (20,000 ha within five years) in 2010, with an annual average increment of 4,000 ha and with an annual change rate of 0.80 percent. (FAO, FRA, 2010; Ethiopia: Forest Resources Current Status and Future Management Options ECRN-UNDP - 2010). In the previous times, exotic plants were dominant species in the plantation programs, but recently, indigenous sp are given more and due consideration in the newly established planted forests. So, this trend has contributed to the increase of diversity of indigenous sp and to their area coverage within the planted forests. In addition, the promotion and implementation of the integrated water-shad development program is significantly contributing to the rehabilitation & development of the deforested &

degraded catchment areas through the construction of physical & biological structures across all the regions of the country. So, the cumulative impact of progressive changes in extent and diversity of planted forests has positively affected all the regulating and supporting ecosystem services, except pollination, on which the effect of the system is not known currently.

Self-recruiting capture fisheries:

The trend of changes within Self-recruiting capture fisheries have a negative impact on ecosystem services like water purification, nutrient cycling, water cycling, habitat provision and oxygen production or gas regulation. Its impact on pest & disease and natural hazard regulation & soil formation & protection is not known currently because of lack of documented data & information. It is assumed that changes within the system do not have any effect on pollination.

Irrigated crops (other):

Because of the increased use of pollutant materials like chemical fertilizers, pest and insecticides, & others inputs within the production system, ecosystem services like pollination**,** water purification and water cycling are negatively affected. But the impacts of changes on the rest of the ecosystem services are not known currently because of lack of documented data & information.

Mixed systems (livestock, crop, forest and /or aquatic and fisheries):
Because of the increased attention and due consideration given to the agro-forestry systems and practices by the federal state, currently the system is progressively increasing both in extent and diversity. But, the problem of the system is that, high yielding improved crop varieties, exotic plant sp and exotic genotypes and their crosses of livestock are being introduced and promoted at the expense of land races, indigenous tree & shrub sp and indigenous livestock breeds (in general, at the expense of the traditional agro-forestry systems) respectively. So, because of the changes observed within the system, there is a decreasing trend of ecosystem services like pollination, water purification and natural hazard regulation. The impact of change on other ecosystem services is not known currently because of lack of documented data and information.

Q. 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.

There is an ethnobotany data base within the Department of Plant Biology and Biodiversity of Addis Ababa University. Additionally, there is an initiative by the Intellectual Property Office within the Ministry of Science and Technology to develop an information system to support maintenance of traditional knowledge including aspects related to genetic resources. It is at an early stage and difficult to evaluate its functionality. There is legislation which addresses the maintenance and modalities of use of traditional knowledge of the community.

Q. 89.

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

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

a. What are the major gaps in information and knowledge?
  - Lack of information and knowledge and low level of information exchange
  - Lack of integration among stakeholders

b. What are the main capacity or resources limitations?
  - Inadequate financial resources to implement integration among stakeholders.

c. What are the main policy and institutional constraints?
  - Deficiency in polices in ensuring integration among stakeholders.
  - Absence of efficient system to ensure stakeholders involvement.

d. What actions are required and what would be the priorities?
  - Develop information system and ensure its exchange.
  - Address policy bottlenecks towards Integration among stakeholders.
  - Secure adequate funding to ensure integrated action of stakeholders.

Q. 90.

With respect to capacity development:

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

a. What are the major gaps in information and knowledge?
  - Lack of proper identification of capacity development gaps.
  - Lack of information to utilize internationally available funds related biodiversity issues.

b. What are the main capacity or resources limitations?
  - Inadequate preparedness to utilize available opportunities towards capacity building.
  - Financial limitations towards capacity building.

c. What are the main policy and institutional constraints?
  - Absence of short and long term human capacity development plans.
  - Inadequacy in technological capacity.

d. What actions are required and what would be the priorities?
  - Develop and implement short and long term capacity building plans.
  - Build capacity and develop system to utilize funding opportunities.

Q. 91.

With respect to knowledge generation and science for the management and sustainable use of biodiversity for food and agriculture:

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

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

- Inadequacy in the quantity and quality of research for the management and sustainable use of biodiversity for food and agriculture.
- Very limited information and knowledge with regard to biodiversity valuation.

b. What are the main capacity or resources limitations?

- Inadequate financial resources limit the extent of development of scientific researches for the management and sustainable use of biodiversity for food and agriculture.
- Inadequate technological capacity and human resource to address research gaps.

c. What are the main policy and institutional constraints?

- Absence of system that ensures integrated action of stakeholders in knowledge generation and management.

Q. 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.

There are many governmental and non government institutions working on the conservation and sustainable utilization of biodiversity for food and agriculture in the country. To meet the target and ensure the conservation of biodiversity for food and agriculture, major challenges to be overcome include lack of smooth integration and collaboration in the activities of the institutions, inadequacy in engaging local communities, and addressing poor institutional set up. Therefore, actions to enhance collaboration and integration among stakeholders include:

- Adequate consultation workshops and awareness creation programs on biodiversity for food and agriculture and on information sharing and clearing mechanisms.
- Strengthen the Clearing House Mechanism (CHM) which also avails information on biodiversity for food and agriculture.
- Establish National and Regional Clearing House Mechanism (NRCHM) which facilitates communication among stakeholders.

- Availing information on conservation, sustainable utilization and access and benefit sharing of biodiversity for food agriculture on NRCHM and Access and Benefit Sharing Clearing House Mechanism (ABS-CHM) websites in different local languages
- Support the CHM with established NRCHM.
- Formulate enabling policies enhancing integration and collaboration of stakeholders.

Q. 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

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
1	*Acacia abyssinica Hochst*. ex. Benth	Fabaceae	Grar	T	Gum	Central Ethiopia	10
2	*Acacia albida* Del.	Fabaceae	Grar (Amh)	T	Seed	Gamo Gofa	3
3	*Acacia etbaica* Schweinf.	Fabaceae	Girar(Amh)	T	Gum	Adiarkay	5
4	*Acacia hockii* De Wild.	Fabaceae	Chachana (Oro)	T	Bark	Gamo Gofa	3, 9
5	*Acacia negrii* Pic.Serm.	Fabaceae	Tedecha (Oro)	T	Bark	Benishangul Gumuz	3
6	*Acacia nilotica* (L.) Willd. ex Del.	Fabaceae	Grar (Amh)	T	Bark and fruit	Gamo Gofa	3
7	*Acacia polycantha* Willd.	Fabaceae	Gnuer (Nue)	T	Gum	Kafa, Nuer	3, 13
8	*Acacia senegal* (L.) Wild.	Fabaceae	Grara (Amh)	T	Seed	Gamo Gofa	3, 9
9	*Acacia seyal* Del.	Fabaceae	Lorkeyuee(Mur)	T	Fruit	Mursi, Majanjir	3, 9, 13
10	*Acacia sieberiana var. woodii* (Burtt-Davy) Keay and Brenan	Fabaceae	Nech-girar (Amh)	T	Gum	Yilmana Densa	4

11	*Acacia tortilis* (Forssk.) Hayne	Fabaceae	Timad (Som)	T	Fruit	Somali region	3
12	*Acalypha fruitcosa* Forssk.	Euphorbiaceae	Keryaya Hola (Mur)	T	Leaf	Mursi and Kaffa	3
13	*Acalypha ornata* A. Rich.	Euphorbiaceae	Atiyhomerpap (Anu)	S	Leaf	Anuak	13
14	*Acanthus sennii* Chiov.	Acanthaceae	Kusheshilie (Amh)	S	Nectar	Yilmana Densa	4
15	*Acokanthera schimperi* (A. DC.) Schweinf.	Apocynaceae	Merenz (Amh)	S	Fruit	Many parts of Ethiopia	3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
16	*Adansonia digitata* L.	Malvaceae	Momret (Tig)	T	Fruit	Waghumra and Tekeze area, Berta	3, 10, 13
17	*Adenia ellenbeckii* Harms	Passifloraceae	Kaguto (Kon)	H	Leaf	Hamar and Xonso	3
18	*Adenia venenata* Forssk.	Passifloraceae	Nama (Kon)	C	Leaf	Hamar and Xonso	9
19	*Aframomum alboviolaceum* (Ridl.) K. Schum.	Zingiberaceae	Ola (Gum)	H	Fruit	Gumuz	13
20	*Albizia grandibracteata* Taub.	Fabaceae	Bamu (Anu)	T	Bark	Anuak, Majanjir	13
21	*Albizia schimperiana* Oliv.	Fabaceae	Sessa (Amh)	T	Gum	Yilmana Densa	4
22	*Allophylus abyssinicus* (Hochst.) Radlk.	Sapindaceae	Imbis (Amh)	T	Fruit	Awi Zone	3
23	*Allophylus macrobotrys* Gilg	Sapindaceae	Athow (Anu)	T	Fruit	Anuak, Kara and Kwego	2, 13
24	*Amaranthus caudatus* L.	Amaranthaceae	Gegebsa (G)	H	Seed	Derashe, Kucha, Xonso and Gamo	1, 3, 9

25	*Amaranthus hybridus* L.	Amaranthaceae	Tsunata (Ber)	H	Leaf	Berta, Kefficho, Majan-jir, Xonso	10, 13
26	*Amaranthus dubius* Thell.	Amaranthaceae	Cayo (Som)	H	Young shoots	Gambella	3
28	*Amaranthus spinosus* L.	Amaranthaceae	Amugnaeder (Anu)	H	Leaf	Anuak, Komo, Nuer	13

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
29	*Amaranthus viridis* L.	Amaranthaceae	Passa (Kon)	H	Young shoots	Xonso	3
30	*Amorphophallus abyssinicus* (A. Rich.) N.E. Br.	Araceae	Bagane (Kon)	H	Tuber	Xonso	3
32	*Amorphophallus gomboczianus* Pic.Serm.	Araceae	Pakanna (Kon)	H	Root	Hamar and Xonso	9
33	*Ampelocissus bombycina* (Bak.) Planch.	Vitaceae	Astigena (Gum)	H	Fruit	Benishangul Gumuz	3
34	*Ampelocissus schimperiana* (Hochst. ex A. Rich.) Planch.	Vitaceae	Omok (Anu)	C	Fruit	Anuak, Berta, Gumuz, Komo	10, 13
35	*Pouteria altissima* (A. Chev.) Baehni	Sapotaceae	Gomu (Maj)	T	Fruit	Majanjir	13
36	*Aneilema beniniense* (P. Beauv.) Kunth	Commelinceae	Aretekodo (Anu)	H	Leaf	Gambella	3

38	*Antidesma venosum* Tul.	Euphorbiaceae	Huda (Oro)	H	Fruit	Metu	3
39	*Argemone mexicana* L.	Papaveraceae	Dandaro (Amh)	H	Seed	Hamar and Xonso	9
40	*Arisaema flavum* (Forssk.) Schott	Araceae	Qoltso (G)	H	Tuber	Gamo	3, 9
41	*Arisaema schimperianum* Schott	Araceae	Qoltso (G)	H	Roots	Gamo	13

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
42	*Arundinaria alpina* K. Schum.	Poaceae	Kerkeha (Amh)	T	Young shoots	Sheko and Bench-menit area	3
43	*Asparagus africanus* Lam.	Asparagaceae	Hingarta (Kon)	S	Seed	Hamar and Xonso	9
44	*Asparagus scaberulus* A. Rich.	Asparagaceae	Mertediye (Gur)	S	Rhizome	Cheha, Hamar and Xonso	4, 9
45	*Asystasia gangetica* (L.) T. Anders.	Acanthaceae	Mella (Anu)	H	Leaf	Anuak, Gumuz, Komo	9, 13
47	*Balanites rotundifolia* (van Tieghem) Blatter	Balanitaceae	Kurarta (K)	S	Fruit	Derashe and Kucha, Kara and Kwego	1, 2, 9
48	*Barleria acanthoides* Vahl	Acanthaceae	Boko (Ham)	S	Flower/ nectar	Hamar and Xonso	9
49	*Barleria eranthemoides* R. Br.	Acanthaceae	Gaya-Oukunba (Ham)	S	Flower/ nectar	Hamar and Xonso	9
50	*Barleria longissima* Lindau	Acanthaceae	Bichbichat (Kon)	S	Flower/	Hamar and Xonso	9

					nectar		
51	*Becium grandiflorum* (Lam.) Pic.Serm.	Lamiaceae	Tabab (Tig)	S	Fruit	Tigray	3
53	*Bidens borianiana* (Sch. Bip. ex Schweinf.) Cufod.	Asteraceae	Ade(Gur)	H	Leaf	Cheha	4

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
54	*Bidens pachyloma* (Oliv. & Hiern) Cufod.	Asteraceae	Chuqii (Oro)	H	Leaf	Kaffa	3
55	*Bidens pilosa* L.	Asteraceae	Kaella (Anu)	H	Leaf	Anuak, Gumuz	13
56	*Bidens prestinaria* (Sch. Bip.) Cufod.	Asteraceae	Assegetsiya (Ber)	H	Leaf	Berta	13
57	*Blyttia fruticulosum* (Decne.) D. V. Field	Asclepiadaceae	Lamtta (Kon)	S	Fruit	Hamar and Xonso	9
58	*Borassus aethiopum* Mart.	Arecaceae	Thuwa (Anu)	T	Fruit, young seedlings and root	Benishangul Gumuz, Kara and Kwego, Anuak, Komo	2,3, 13
59	*Boscia coriacea* Pax	Capparidaceae	Geri (Som)	S	Fruit	Dassanach, Xonso	3, 9
60	*Boscia salicifolia* Oliv.	Capparidaceae	Mudaqelle (Ham)	T	Leaf	Hamar and Xonso	9
61	*Boscia senegalensis Lam*. ex Poir.	Capparidaceae	Tubaqe (Tse)	S	Fruit	South Ethio	3

62	*Boswellia papyrifera* (Del.) Hochst.	Burseraceae	Meker (Amh)	T	Gum	Filikilik	7
63	*Bridelia micrantha* (Hochst.) Baill.	Euphorbiaceae	Welakoo (Sid)	S	Fruit	Benishangul Gumuz, Derashe and Kucha	1,3
64	*Bridelia scleroneura* Muell. Arg.	Euphorbiaceae	Haragjello (Ber)	S	Fruit	Berta, Gumuz	9, 10, 13
65	B*uddleja polystachya* Fresen.	Loganiaceae	Madera (Afa)	S	Fruit	Afar	3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
66	*Butyrospermum paradoxum* (Gaertn. f.) Hepper	Sapotaceae	Wado (Anu)	T	Fruit	Anuak	13
67	*Cadaba farinosa* Forssk.	Capparidaceae	Anaedo (Anu)	S	Fruit	Xonso, Anuak, Nuer, Kara and Kwego	2, 3, 13
68	*Canthium bogosense* (Martelli) Penzig	Rubiaceae	Ajarse (Som)	S	Fruit	Gursum	7
69	*Canthium pseudosetiflorum* Bridson	Rubiaceae	Timir Lojir (Som)	S	Fruit	Zeyisse, Hamar and Xonso	3, 9
70	*Capparis decidua* (Forssk.) Edgew.	Capparidaceae	Gumero (Amh)	S	Fruit	Wollo	3
71	*Capparis erythrocarpos* Isert	Capparidaceae	Omono (Anu)	S	Fruit	Anuak	13
72	*Capparis fascicularis* DC.	Capparidaceae	Qawisa (Oro)	S	Fruit	Dheeraa	11
73	*Capparis tomentosa* Lam.	Capparidaceae	Ungiero (Anu)	S	Fruit	Gambella	3
74	*Caralluma sprengeri* N. E. Br.	Asclepiadace	Baqibaqa (Kon)	S	Leaf	Xonso	6

		ae					
75	*Cardamine trichocarpa* A. Rich.	Brassicaceae	Okoy (Maj)	H	Young shoots	Gambella	3
77	*Catunaregam nilotica* (Stapf) Tirveng.	Rubiaceae	Ondorko (Tse)	T	Fruit	Bena	7
78	*Caylusea abyssinica* (Fresen.) Fisch. & Mey	Resedaceae	Xomita (K)	H	Leaf	Derashe and Kucha	1, 10

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
79	*Cayratia ibuensis* (Hook.f.) Suesseng.	Vitaceae	Daole (Mur)	H	Tuber	Gambella	3
80	*Celosia anthelminthica* Asch. In Schweinf.	Amaranthaceae	Chicho (Ham)	H	Leaf	Hamar and Xonso	9
81	*Celosia argentea* L.	Amaranthaceae	Horbaita (Kon)	H	Leaf	Hamar and Xonso	9
82	*Celosia trigyna* L.	Amaranthaceae	Torchata (Kon)	H	Young shoots	Xonso, Gambella, Gumuz	3, 13
83	*Celtis africana* Burm. f.	Ulmaceae	Dhawashya (D)	T	Fruit	Derashe and Kucha, Kara and Kwego , Gam-bella	1, 2, 3
84	*Celtis toka* (Forssk.) Hepper & Wood	Ulmaceae	Laere (Anu)	S	Fruit	Anuak, Kara and Kwego, Komo	2, 3, 13
85	*Celtis zenkeri* Engl.	Ulmaceae	Bado (Anu)	S	Fruit	Anuak	13
86	*Cephalopentandra ecirrhosa* (Cogn.) C. Jeffrey	Cucurbitaceae	NM	S	Fruit	Harar	8

87	*Chasmanthera dependens* Hochst.	Menisper-maceae	Tsatsa (Ham)	C	Fruit	Hamar and Xonso	9
88	*Cissus cornifolia* (Bak.) Planch.	Vitaceae	Asinsidhi (Ber)	C	Fruit	Berta	10
89	*Cissus populnea* Guill. & Perr.	Vitaceae	Gniallo (Anu)	C	Stem	Anuak, Komo	13
90	*Citrullus lanatus* (Thunb.) Matsum & Nakai	Cucurbitaceae	Blass (Kon)	C	Fruit	Hamar and Xonso	9
91	*Clausena anisata* (Willd.) Benth.	Rutaceae	Funata (K)	S	Fruit	Derashe and Kucha, Bench Menit	1,3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
92	*Cleome allamanii* Chiov.	Capparidaceae	Erreso (Kon)	C	Leaf	Hamar and Xonso	9
93	*Cleome gallaensis* Gilg and Bened.	Capparidaceae	Armagussa (Amh)	S	Leaf	Goma	4
94	*Cleome gynandra* L.	Capparidaceae	Akiya (Anu)	H	Young shoots	Nuer, Kara and Kwego, Komo	2, 3, 10,13
95	*Cleome hanburyana* Penz.	Capparidaceae	Kedhi (Ben)	H	Leaf	Humbo	3
96	*Cleome monophylla* L.	Capparidaceae	Doran (Som)	H	Leaf	Bena	3
97	*Coccinia abyssinica* (Lam.) Cogn.	Cucurbitaceae	Anchote (Oro)	C	Young shoots, tubers and fruits	Many parts of Ethiopia	3
98	*Coccinia adoensis* (Hochst ex A. Rich) Cogn.	Cucurbitaceae	Thong-diit (Nue)	H	Fruit	Nuer	10,13
99	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	Buta (KA)	C	Fruit	Kara and Kwego, Mursi, Anuak	2, 3, 10, 13

100	*Combretum aculeatum* Vent.	Combretaceae	Kalawuri (Mur)	S	Seed	Mursi, Xonso	3
101	*Combretum molle* R. Br ex G. Don	Combretaceae	Sebe (Ham)	T	Gum	Hamar and Xonso	9, 13
103	*Commelina diffusa* Burm. f.	Commelinacea	Welilo (G)	H	Young leaves	Derashe and Kucha, Gamo, Gambella	1, 3
104	*Commelina erecta* L.	Commeliaceae	Surnate (Mur)	H	Leaf	Mursi	3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
105	*Commelina foliacea* Chiov.	Commeliaceae	Qorde (Ham)	H	Leaf	Hamar and Xonso	9
106	*Commelina imberbis* Ehrenb. ex Hassk.	Commeliaceae	Aretekodo (Anu)	H	Leaf	Anuak, Komo	9, 13
107	*Commelina petersii* Haask.	Commeliaceae	Korde (Ham)	H	Leaf	Hamar and Xonso	9
108	*Commelina zambesica* C. B. Clarke	Commeliaceae	Gnok (Nue)	H	Leaf	Gambella, Komo	3, 13
109	*Commiphora africana (A. Rich.) Engl.*	Burseraceae	Qahitta (Kon)	S	Leaf, fruit and root	Many parts of Ethiopia	3
110	*Commiphora baluensis* Engl.	Burseraceae	Hagar madow (Som)	T	Fruit	Keyafer	7
111	*Commiphora boiviniana* Engl.	Burseraceae	Elawa (Kon)	S	Fruit	Sidamo	3
112	*Commiphora confusa* Vollesen	Burseraceae	Qeyi(Ham)	T	Root	Hamar and Xonso	9
113	*Commiphora habessinica* (Berg) Engl.	Burseraceae	Mesh-Qeyi(Ham)	T	Root, stem	Hamar and Xonso	9

114	*Commiphora kataf* (Forssk.) Engl.	Burseraceae	Kahatta-ata(Kon)	T	Leaf	Hamar and Xonso	9
115	*Commiphora rostrata* Engl.	Burseraceae	Dirraa (Oro)	S	Young leaves and shoots	Kelafo	3
116	*Commiphora schimperi* (Berg.) Engl.	Burseraceae	Qeyi (Ham)	T	Root	Hamar and Xonso	9
117	*Commiphora terebinthina* Vollesen	Burseraceae	Kahatta-tima(Kon)	T	Root	Hamar and Xonso	9
118	*Convolvulus glomeratus* Hochst ex Choisy	Convolvulaceae	Bolok (KW)	H	Leaf	Kara and Kwego	2

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
119	*Corallocarpus schimperi* (Naud.)Hook. f.	Cucurbitaceae	Danqesha (Ham)	C	Leaf	Hamar and Xonso	9
120	*Corbichonia decumbens* (Forssk.) Exell	Molluginaceae	Gnomai (Mur)	H	Whole	Mursi, Hamar and Xonso	3
121	*Corchorus aestuans* L.	Tiliaceae	Awachuwaey (Anu)	H	Leaf	Anuak	13
122	*Corchorus fascicularis* Lam.	Tiliaceae	Awachuwaey (Anu)	H	Leaf	Gambella	3
124	*Corchorus tridens* L.	Tiliaceae	Maero (Nue)	H	Leaf	Gambella, Hamar and Xonso	3, 9
125	*Corchorus trilocularis* L.	Tiliaceae	Shosha interse (G)	H	Young leaves	Derashe and Kucha Gamo	1, 3, 9
126	*Cordeauxia edulis* Hems l.	Fabaceae	Yeheb (Som)	S	seed	Ogaden	3
128	*Cordia monoica* Roxb.	Boraginacea	Adebot (Afa)	T	Fruit	Derashe, Xonso, Ku-	3

		e				sume	
129	*Cordia ovalis* R. Br. ex DC.	Boraginacea e	Luketa (D)	S	Fruit	Derashe and Kucha	1
130	*Cordia sinensis* Lam	Boraginacea e	Maderra (Oro)	T	Fruit	Borana, Xonso, Kara and Kwego, Mursi, Somali, Mursi	2, 3
131	*Crassocephalum montuosum* (S. Moore) Milne-Redh.	Asteraceae	Miningi(Maj)	H	Leaf	Gambella	3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
132	*Crassocephalum rubens* (Juss. ex Jacq.) S. Moore	Asteraceae	Shekaadona(Ber)	H	Leaf	Berta	13
133	*Crateva adansonii* DC.	Capparidaceae	Bado (Anu)	S	Fruit	Anuak, Komo, Nuer	13
134	C*rotalaria incana* L.	Fabaceae	Qulibush (Ham)	H	Leaf	Hamar and Xonso	9
135	*Crotalaria phillipsiae* Bak.	Fabaceae	Denqesha (Ham)	H	Leaf	Hamar and Xonso	9
136	*Crotalaria polysperma* Kotschy	Fabaceae	Tekera (Ham)	H	Leaf	Hamar and Xonso	9
137	*Cucumella kelleri* (Cogn.)C. Jeffrey	Cucurbitaceae	Uneexo(Som)	C	Fruit	Degahabur 38499	7
138	*Cucumis dipsaceus* Ehrenb ex. Spach	Cucurbitaceae	Bequnba (Ham)	C	Leaf	Hamar and Xonso	9
139	*Cucumis jeffreyanus* Thulin	Cucurbitaceae	Qalfon (Som)	S	Fruit	Somali	7
140	*Cucumis pustulatus* Naud. ex Hook. f.	Cucurbitaceae	Qalfoon (Som)	C	Fruit	Degahabur	7
141	*Cymbopogon caesiu* (Hook. &	Poaceae	Gnieera Woni	H	Inflorescen	Berta	13

	Arn.) Stapf		(Ber)		ce		
142	*Cyperus bulbosus* Vahl	Cyperaceae	Kunti (Tig)	H	Bulb	Tigray, Hamar and Xonso	3, 9
143	*Cyperus esculentus* L.	Cyperaceae	Kwentii (Tig)	H	Tubers	Tigray	3
144	*Cyperus rotundus* L.	Cyperaceae	Kuntayle (Ham)	H	Root	Hamar and Xonso	9
145	*Cyperus usitatus* Burch.	Cyperaceae	Engicha (Amh)	H	Bulb	Yilmana Densa	4

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
146	*Cyphostemma adenocaule* (A. Rich.) Wild & Drummond	Vitaceae	Okoto (KA)	H	Root (peeled)	Kara and Kwego	2
147	*Datura stramonium* L.	Solanaceae	Astenagir (Amh)	S	Nectar	Yilmana Densa	4
148	*Delonix regia* (Boj. ex. Hook) Raf.	Fabaceae	Merqaya(Ham)	T	Seed	Hamar and Xonso	9
149	*Digera muricata* (L.) Mart.	Amaranthaceae	Kogatu (Kon)	H	Leaf	Xonso	3, 9
150	*Dioscorea abyssinica* Hochst. ex Kunth	Dioscoreaceae	Boye (Sid)	C	Tubers	Kafa	3
151	*Dioscorea bulbifera* L.	Dioscoreaceae	Muwana (Anu)	C	Tubers	Anuak, Gamo, Berta, Komo	3, 13
152	D*ioscorea dumetorum* (Kunth) Pax	Dioscoreaceae	NM	H	Root	Gambella	3, 10
153	*Dioscorea praehensilis* Benth.	Dioscoreaceae	Modo (Anu)	C	Tubers	Gamo and Anuak, Dera-she and Kucha, Komo, Majanjir	1, 13
154	*Dioscorea quartinana A*. Rich.	Dioscoreace	Kuba (Oro)	C	Tubers	Kafa	3

		ae					
155	*Dioscorea schimperiana* Kunth	Dioscoreaceae	Ankoruumbaa (Oro)	C	Root	Kafa	3
156	*Diospyros abyssinica* (Hiern) F. White	Ebenaceae	Dul'o (G)	T	Fruit	Derashe and Kucha, Gamo, Hamar	1, 3, 9
157	*Diospyros mespiliformis* Hochst. ex A. DC.	Ebenaceae	Betre Musie (Amh)	T	Fruit	Many parts of Ethiopia	3, 10
158	*Dobera glabra* (Forssk.) Poir.	Salvadoraceae	Kerseta (K)	T	Seed	Derashe and Kucha, Kara and Kwego, Xonso	1, 2, 3, 9

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
159	*Dombeya longibracteolata* Seyani	Sterculiaceae	Kamil (Ham)	S	Fruit	Hamar and Xonso	9
160	*Dombeya torrida* (G.F. Gmel.) P. Bamps	Sterculiaceae	Akota (K)	T	Fruit	Kusume, Derashe and Kucha	3
161	*Dorstenia barnimiana* Schweinf.	Moraceae	Kuritata (Kon)	H	Root	Hamar and Xonso	9
162	*Dovyalis abyssinica* (A. Rich.) Warb.	Flacourtiaceae	Koshim (Amh)	S	Fruit	Many parts of Ethiopia	3
163	*Dracaena afromontana* Mildbr.	Dracaenaceae	Shuda (Kaf)	S	Young shoots	Sheko and Bench-Menit	3
164	*Ehretia cymosa* Thonn.	Boraginaceae	Borborta (K)	T	Fruit	Derashe and Kucha, Hamar	1, 3
165	*Ekebergia capensis* (Sparrm.)	Meliaceae	Sheru (Bench)	T	Fruit	Bench-Meinit	3
166	*Elaeodendron buchananii* (Loes.) Loes	Celastraceae	Chogaey (Maj)	T	Fruit	Majanjir	13
167	*Embelia schimperi* Vatke	Myrsinaceae	Inqoko (D)	S	Fruit	Derashe and Kucha	1

168	*Eragrostis cilianensis* (All.) Vign. ex Janchen	Poaceae	Ginchile (Ham)	H	Seed	Hamar and Xonso	9
169	*Eragrostis papposa* (Roem. & Schult.) Steud.	Poaceae	Qercha (Ham)	H	Seed	Hamar and Xonso	9
170	*Eragrostis tremula* Hochst. ex Steud	Poaceae	Buska (Ham)	H	Seed	Hamar and Xonso	9
171	E*riobotrya japonica* (Thunb.) Lindl.	Rosaceae	Woshimela (Amh)	T	Fruit	Goma	4

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
172	*Eriosema cordifolium* Hochst. ex A. Rich.	Fabaceae	Silinga (Oro)	H	Root	Guji, Gamo, Wolaita	3, 10
173	*Erucastrum abyssinicum* (A. Rich.) R. E. Fries	Brassicaceae	Bushkin (Maj)	H	Leaf and stem	Gambella	3
					stem		
175	*Erythrina Brucei* Schweinf.	Fabaceae	Korch (Amh)	T	Root	Dheeraa	11
176	E*rythrococca abyssinica* Pax	Euphorbiaceae	Beskwi (Ham)	S	Fruit	Hamar and Xonso	9
177	*Ethulia gracilis* Del.	Asteraceae	Apuda (Anu)	H	Whole part burned	Anuak, Nuer	13
178	*Euclea divinorum* Hiern	Ebenaceae	Unsi (Ben)	T	Fruit	Bena, Derashe and Kucha	1, 3, 9
179	*Euclea racemosa* Murr.	Ebenaceae	Dedaho (Amh)	T	Fruit	Xonso, Abay Gorge, Nefas Mewcha	3
180	*Ferula communis* L.	Apiaceae	Dog (Amh)	H	Young shoot	Alamata	4

182	*Ficus capreaefolia* Del.	Moraceae	Ageta (Anu)	T	Fruit	Many parts of Ethiopia	3
183	*Ficus glumosa* Del.	Moraceae	Kilta (Oro)	T	Fruit	Many parts of Ethiopia	3
184	*Ficus ingens* (Miq.) Miq	Moraceae	Lugo (Som)	T	Fruit	Many parts of Ethiopia	3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
185	*Ficus mucuso* Ficalho	Moraceae	Shola (Bench)	T	Fruit	Gambella and Bench Menit	3
186	*Ficus ovata* Vahl.	Moraceae	Warka (Amh)	T	Fruit	Many parts of Ethiopia	3
187	*Ficus palmata* Forssk.	Moraceae	Yekola-Beles (Amh)	T	Fruit	Many parts of Ethiopia	3
188	F*icus platyphylla* Del.	Moraceae	Leiya (Kon)	T	Fruit	Hamar and Xonso	9
189	*Ficus sur* Forssk.	Moraceae	Worrka (Tig)	T	Fruit	Many parts of Ethiopia	3, 9
190	*Ficus sycomorus* L.	Moraceae	Wola (Wel)	T	Fruit	Many parts of Ethiopia	1, 2, 3,13
191	*Ficus thonningii* Blume	Moraceae	Ata (Ham)	T	Fruit and gum	Hamar and Xonso	9, 10, 12
192	*Ficus vallis-choudae* Del.	Moraceae	Boba (Zay)	T	Fruit	Many parts of Ethiopia	3
193	*Ficus vasta* Forssk.	Moraceae	Artyita(D)	T	Fruit	Derashe and Kucha, Gumuz	1, 10

195	*Flueggea leucopyrus* Willd.	Euphorbiaceae	Rarata (K)	S	Seed	Derashe and Kucha, Xonso	1
196	F*lueggea virosa* (Willd.) Voigt.	Euphorbiaceae	Tanta (KA)	T	Fruit	Kara and Kwego , Benis-hangul Gumuz, Xonso, Nuer & Komo	2, 3, 10
197	*Garcinia livingstonei* T. Anders	Clusiaceae	Shamper (Ham)	S	Fruit	Hamar and Xonso	9

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
198	*Garcinia ovalifolia* Oliver	Clusiaceae	Karawwayyuu (Maj)	T	Fruit	Gambella & Metu	3
199	*Gardenia fiorii* Chiov.	Rubiaceae	Himir (Som)	S	Fruit	Wardheer	7
200	*Gardenia ternifolia* Schumach. & Thonn.	Rubiaceae	Duwong (Anu)	S	Fruit	Benishangul Gumuz, Anuak, Komo, Shinasha	10
201	*Girardinia diversifolia* (Link) Friis	Urticaceae	Doba (Tig)	H	Leaf	Darassa	3
202	*Grewia arborea* (Forssk.) Lam.	Tiliaceae	Wideir (Som)	T	Fruit	Many parts of Ethiopia	3
203	*Grewia balensis* Sebsebe	Tiliaceae	Bereza (K)	T	Fruit	Konso	9
204	*Grewia bicolor* Juss.	Tiliaceae	Bereza (K)	T	Fruit	Kara and Kwego,Xonso & Kusume,Derashe and Kucha	1,2, 3
205	*Grewia erythraea* Schweinfurth	Tiliaceae	Midho-Cas (Som)	S	Fruit	Hargeisa	3
206	*Grewia ferruginea* Hochst. ex A. Rich.	Tiliaceae	Lenkwata (Amh)	T	Fruit	Many parts of Ethiopia	3

207	*Grewia flavescens* A. Juss.	Tiliaceae	Dhabi-Qurquraale (Som)	S	Fruit	Jijiga, Hamar and Xonso	3, 9
208	*Grewia kakothamnos* K. Schum.	Tiliaceae	Demak (KA)	S	Fruit	Kara and Kwego	2
209	*Grewia lilacina* K. Schum.	Tiliaceae	Kocheta (Kon)	S	Fruit	Hamar and Xonso	9
210	*Grewia mollis* A.Juss.	Tiliaceae	Tema (Wel)	T	Fruit	Many parts of Ethiopia	3, 10,13

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
211	*Grewia schweinfurthii* Burret	Tiliaceae	Qorawaqo (K)	S	Fruit	Derashe and Kucha	1
212	*Grewia tenax* (Forssk.) Fiori	Tiliaceae	Kanatol (Tig)	S	Fruit	Many parts of Ethiopia	3
213	*Grewia trichocarpa* Hochst. ex A. Rich	Tiliaceae	Roboy (Tig)	T	Fruit	Alamata, Dheeraa	4, 11
214	*Grewia velutina* (Forssk.) Vahl	Tiliaceae	Dhayita (Kon)	T	Fruit	Bena, Tsemay, Zeyse, Xonso	3
215	*Grewia villosa* Willd.	Tiliaceae	Rug (KA)	S	Fruit	Derashe, Kucha , Kara and Kwego,Hamar	2,3, 9
217	*Heliotropium steudneri* Vatke	Boraginaceae	Gabo (KA)	T	Fruit	Kara and Kwego	2
218	*Hibiscus calyphyllus* Cavan.	Malvaceae	Gnilorbey (Anu)	H	Leaf	Anuak	13
219	*Hibiscus cannabinus* L.	Malvaceae	Wuya (Anu)	H	Leaf	Berta	13
220	*Hoslundia opposita* Vahl	Lamiaceae	Kabushuie (Mur)	S	Fruit	Mursi, Hamar and	3, 9

						Xonso	
221	*Hydnora johannis* Becc.	Hydnoraceae	Likeh (Som)	H	Roots	Deghabour, Hamar and Xonso	3, 9
222	*Hygrophila schulli* (Hamilt.) M.R. & S.M. Almeida	Acanthaceae	Utiwaello (Anu)	H	Whole dried	Gambella	3
223	*Hygrophila spiciformis* Lindau	Acanthaceae	Utiwaello (Anu)	S	Leaf and wood ash	Gambella	13

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
224	H*yphaene compressa H*. Wendl.	Arecaceae	Annui (Mur)	T	Fruit	Mursi	3
225	*Hyphaene thebaica* (L.)Mart.	Arecaceae	Bar (Som)	T	Fruit	Gambella	3, 9
226	*Hypoestes aristata* (Vahl) Roem. & Schult.	Acanthaceae	Hamshika (Oro)	H	Leaf	Metu	3
227	*Hypoestes forskaolii* (Vahl) R. Br.	Acanthaceae	Ononayta (D)	H	Leaf	Kusume and Derashe	3
228	*Ipomoea aquatica* Forssk.	Convolvulaceae	Tach (Nue)	H	Leaf	Gambella, Komo	3, 10
229	*Ipomoea coscinnosperma* Hochst.ex Choisy	Convolvulaceae	Songoderderta(Kon)	H	Fruit	Hamar and Xonso	9
230	*Ipomoea marmorata* Britt. & Rendle	Convolvulaceae	Omborooke (Oro)	S	Root	Kara and Kewego , Afar, Gambella	2, 9
231	*Ipomoea plebeia* R. Br.	Convolvulaceae	Boloko (KA)	S	Leaf	Kara and Kewego	2
232	*Ipomoea sinensis* (Desr.) Choisy	Convolvulaceae	Kamiwi (Ham)	S	Leaf	Hamar and Xonso	9
233	*Justicia calyculata* Deflers	Acanthaceae	Randolla (Kon)	H	Leaf	Hamar and Xonso	9

234	*Justicia flava* (Vahl) Vahl	Acanthaceae	Honnona (Kon)	H	Leaf	Hamar and Xonso	9
235	*Justicia ladanoides* Lam.	Acanthaceae	Aelangiya (Gum)	H	Leaf	Gumuz, Hamar and Xonso	9, 13
236	*Justicia schimperiana* (Hochst. ex Nees) T. Anders.	Acanthaceae	Dhummuugaa (Oro)	S	Nectar	Metu	3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
237	K*edrostis foetidissma* (Jacq.) Cogn.	Cucurbitaceae	Shunto (KA)	C	Leaf	Kara, Kwego ,Hamar and Xonso	2, 9
238	*Kedrostis leloja* (Forssk.) C. Jeffrey	Cucurbitaceae	Garto (Ham)	C	Fruit and leaf	Hamar and Xonso	9
239	*Kedrostis pseudogijef* (Gilg) C. Jeffrey	Cucurbitaceae	Naja (Ham)	C	Leaf	Gamo, Hamar and Xonso	3, 9
240	*Lagenaria siceraria* (Molina) Standl.	Cucurbitaceae	Khil (Kaf)	C	Young fruit	Kafa	3
241	L*andolphia buchananii* (Hall.f.) Stapf	Apocynaceae	Yemo (Kaf)	C	Fruit	Kafa, Shinasha	3,13
242	*Lantana rhodesiensis* Mold.	Verbenaceae	Untaorayitate (D)	S	Seed and leaf	Derashe and Kucha	1
243	*Lannea humilis* (Oliv.) Engl.	Anacardiaceae	Gumedaa (Ben)	T	Root bark	Omo, Hamar and Xonso	3, 9
244	L*annea malifolia* (Chiov.) Sacl.	Anacardiaceae	Wuh-Andri (Som)	T	Fruit and seed	Somali	3

245	*Lannea schimperi* (A. Rich.) Engl.	Anacardiaceae	Dobbe (Zay)	T	Fruit and seed	Many parts of Ethiopia	3
246	*Lannea schweinfurthii* (Engl.) Engl.	Anacardiaceae	Kiringenni (Mur)	T	Fruit	Mursi & Gambella	3
247	*Lannea triphylla* (A. Rich.) Engl.	Anacardiaceae	Waanri (Som)	S	Root	Somali, Waghmra	3
248	*Lannea welwitschii* (Hiern) Engl.	Anacardiaceae	Arim (Anu)	T	Fruit	Anuak, Komo	13
249	*Lantana camara* L.	Verbenaceae	Yeregna genfo (Amh)	S	Fruit	Yilmana Densa	4

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
250	*Lantana ukambensis* (Vatke) Verdc.	Verbenaceae	Untaorayitate(Der)	S	Leaf	Derashe	3
251	*Launaea intybacea* (Jacq.) Beauv.	Asteraceae	Hankolayita (Kon)	H	Leaf	Xonso	3
252	*Launaea taraxacifolia* (willd.) Amin ex C. Jeffrey	Asteraceae	Hangoleita (Kon)	H	Leaf	Xonso, Komo	3, 10
253	*Leonotis nepetifolia* (L.) R. Br.	Lamiaceae	Angesho (Ber)	H	Nectar	Berta	13
254	*Lecaniodiscus fraxinifolius* Bak.	Sapindaceae	Choro (KA)	T	Fruit	Kara and Kwego	2
255	*Lepidotrichillia volkensii* (Gurke) Leroy	Meliaceae	Kijang (Anu)	T	Fruit	Anuak	13
256	*Lepisanthes senegalensis* (Juss.ex Poir.) Leenh	Sapindaceae	Sembo (Amh)	T	Fruit	Gambella, Derashe and Kucha	1, 3
257	*Leptadenia hastata* (Pers.) Decne	Asclepiadaceae	Haila (Kus)	C	Leaf	Derashe, Xonso, Kusume, Anuak	1,9,13
258	*Leucas glabrata* (Vahl)Sm. In Rees	Lamiaceae	Ountinqama (Ham)	S	Leaf	Hamar and Xonso	9
259	*Limnophyton obtusifolium* (L.)	Alismataceae	Tuytuy (Anu)	H	Whole Ash	Anuak	13

	Miq.						
260	*Luffa cylinderica* (L.) M. J. Roem.	Cucurbitaceae	Lipa (Anu)	C	Fruit and leaf	Majanjir	10
261	*Lycium shawii* Roem. & Schult.	Solanaceae	Doreda(KA)	T	Leaf	Kara and Kwego	2

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
263	*Maerua oblongifolia* (Forssk.) A. Rich.	Capparidaceae	Lecho (KA)	S	Leaf	Kara and Kwego, Mursi	2,3
264	*Maerua subcordata* (Gilg) De Wolf	Capparidaceae	Kulup (KA)	T	Fruit	Kara and Kwego, Hamar	2, 9
265	*Maerua triphylla* A. Rich.	Capparidaceae	Anaedo (Anu)	S	Leaf	Anuak	13
266	*Manilkara butugi* Chiov.	Sapotaceae	Wonni (Maj)	T	Fruit	Majanjir	10
267	*Maytenus senegalensis* (Lam.) Exell	Celastraceae	Lele (KW)	S	Leaf	Kara and Kwego, Berta, Gumuz	2, 13
269	*Mimusops laurifolia* (Forssk.) Friis	Sapotaceae	Geza (Gur)	S	Fruit	Cheha	4
270	*Momordica foetida* Schumach.	Cucurbitaceae	Ye'kurra areg (Amh)	S	Fruit and tuber	Yilmana Densa, Berta, Komo	4, 13
271	*Momordica rostrata* A. Zimm.	Cucurbitaceae	Kulo (Ham)	C	Fruit and leaf	Hamar and Xonso	9

272	*Moringa stenopetala* (Bak. f.) Cufod.	Moringaceae	Haleko (KA)	T	Leaf	Kara and Kwego, Mursi, Sidamo	2, 3, 9
273	*Morus alba* L.	Moraceae	Injori (Amh)	S	Fruit	Cheha	4
274	*Morus mesozygia* Stapf	Moraceae	Ochik (Anu)	T	Fruit	Anuak	13
275	*Mussaenda arcuata* Poir.	Rubiaceae	Mixaro (G)	C	Fruit	Gamo, Derashe and Kucha	1, 3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
276	*Myrsine africana* L.	Myrsinaceae	Xinqitata (D)	T	Fruit and Seed	Derashe and Kucha, Hamar	1, 9
277	*Nicandra physaloides* (L.) Gaertn.	Solanaceae	Peet (Nue)	H	Fruit	Nuer	13
278	*Nymphaea lotus* L.	Nymphaeaceae	Kutako (KA)	H	Root	Kara and Kwego	2
279	*Nymphaea nouchali* Burm.f.	Nymphaeaceae	Geleila (Af)	H	Tuber	Kara and Kewego , Afar, Gambella	2, 3, 13
280	*Ochna leucophloeos* Hochst. ex A. Rich.	Ochnaceae	Anddha (Gum)	S	Fruit	Gumuz, Komo, Nuer	13
281	*Ocimum americanum* L.	Lamiaceae	Meno (Anu)	H	Inflorescence	Gambella	3
282	O*cimum forskolei* Benth.	Lamiaceae	Kurutattita (Kon)	H	Leaf and nectar	Hamar and Xonso	9
283	*Olea europaea subsp. cuspidata* (Wall. ex G. Don) Cif.	Oleaceae	Shemaho (G)	T	Leaf	Many parts of Ethiopia	3
284	*Olea capensis subsp. macrocarpa* (C.A. Wright.) Verdc.	Oleaceae	Bulumtsee (Ber)	T	Fruit	Berta	13

287	*Opuntia stricta* (Haworth)Haworth	Cactaceae		S	Fruit and leaf	Komo	13
288	*Ormocarpum trichocarpum* (Taub.) Engl.	Fabaceae	Shibde (Tse)	S	Flower	Tsemay	3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
289	*Oryza barthii* A. Chev.	Poaceae	Alumo (Anu)	H	Seed	Anuak	13
290	*Oryza longistaminata* A. Chev. & Roehr.	Poaceae	Alumo (Anu)	H	Seed	Anuak, Nuer	13
291	*Osyris quadripartita* Decn.	Santalaceae	Wato (Kon)	S	Fruit	Hamar and Xonso	9
292	*Oxalis corniculata* L.	Oxalidaceae	Melgissa (Kon)	H	Leaves, flower and seed	Hamar and Xonso	9, 10
293	*Oxygonum sinuatum* (Meisn.) Dammer	Polygonaceae	Chew-mirahut (Tig)	S	Leaf	Alamata, Hamar and Xonso	4, 9
294	*Oxytenanthera abyssinica* (A. Rich.) Munro	Poaceae	Enta (Gum)	T	Young shoots, fruits, Rhi-zome, seeds	Benishangul Gumuz, Berta	3, 10
295	*Pachycymbium sprengeri* (N. E. Br.) M. G. Gilbert	Asclepiadaceae	Baqibaqa (Kon)	H	Young shoot	Xonso	3
296	*Pappea capensis* Eckl. & Zeyh.	Sapindaceae	Defi (Ham)	T	Fruit and	Hamar and Xonso	9, 11

					seed		
297	*Pavetta abyssinica* Fresen.	Rubiaceae	Maduginata (K)	S	Fruit	Derashe and Kucha	1
298	*Pavetta crassipes* K. Schum.	Rubiaceae	Yetsewuha (Gum)	T	Fruit	Benishangul Gumuz	3
299	*Pavetta gardenifolia* A. Rich.	Rubiaceae	Shambulo (Ham)	S	Fruit	Hamar and Xonso	9

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
300	*Pentarrhinum inspidum* E. Mey	Asclepidaceae	Kokorpha (D)	C	Leaf	Derashe and Kucha	1
301	*Pentarrhinum somaliense* (N.E. Br.) Liede	Asclepiadaceae	Guriso (Tig)	S	Fruit and seed	Alamata	4
302	*Peponium vogelii* (Hook. f.) Engl.	Cucurbiaceae	Tojo (Kaf)	C	Fruit	Kafa	3
303	*Pergularia daemia* (Forssk.) Chiov.	Asclepiadaceae	Korroda (Kon)	C	Leaf	Xonso	3
304	*Phoenix reclinata* Jacq.	Arecaceae	Zamba (D)	S	Fruit	Derashe and Kucha, Berta, Kefficho	1, 13
305	*Phyllanthus boehmii* Pax	Euphorbiceae	Butbot (Nue)	H	Leaves and young shoots	Nuer	13
306	*Phyllanthus limmuensis* Cufod.	Euphorbiceae	Karacho (Mur)	S	Fruit	Mursi	3
307	*Physalis micrantha* Link	Solanaceae	Yefereng Awit (Amh)	S	Fruit	Wonji	7
308	*Physalis peruviana* L.	Solanaceae	Awxetecha (D)	H	Fruit	Derashe and Kucha, Gamo, Majanjir	1, 10

309	*Phytolaca dodecandra* L. H´erit.	Phytolacaceae	Indod (Amh)	S	Leaf	Goma	4

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
311	*Plectranthus edulis* (Vatke) Agnew	Lamiaceae	Ajo (Kaf)	H	Rhizome and leaves	Kafa	3
312	*Podocarpus falcatus* (Thunb.) R. Br. ex Mirb.	Podocarpaceae	Dagucho (Sid)	T	Fruit oil	Chercher	3
315	*Pouteria altissima* (A. Chev.) Baehni	Sapotaceae	Gomu (Maj)	T	Fruit	Gambella	3
316	*Premna resinosa* (Hochst.) Schauer	Lamiaceae	Mermer (Ham)	S	Fruit	Hamar and Xonso	9
317	*Prosopis juliflora* (Sw.) DC.	Fabaceae	Woyane Zaf (Amh)	T	Fruit	Dheeraa	10, 11
318	*Prunus africana* (Hook.f.) Kalkm.	Rosaceae	Chachu (Bench)	T	Fruit	Bench-menit	3

319	*Psydrax schimperiana* (A. Rich.) Bridson	Rubiaceae	Kaheltta (Kon)	S	Fruit	Xonso	3, 9
320	*Pupalia micrantha* Hauman	Amaranthaceae	Yedena (Ham)	H	Leaf	Hamar and Xonso	9
321	*Pycnostachys abyssinica* Fresen.	Lamiaceae	Fanfua (Gur)	S	Leaf	Cheha	4
322	*Pyrenacantha kaurabassana* Baill.	Icacinaceae	Appel(Anu)	C	Tubers	Anuak, Komo	10

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
323	*Pyrostria phyllanthoidea* (Baill.) Bridson	Rubiaceae	Qoodho-Orgi (Som)	S	Fruit	Gaara Dalacha	7
324	*Rhamnus prinoides* L'Herit.	Rhamnaceae	Gesho (Amh)	T	Leaf and stem	Many parts of Ethiopia	8
325	*Rhamnus staddo* A. Rich.	Rhamnaceae	Teddo (Oro)	T	Leaf and stem	Many parts of Ethiopia	3
326	*Rhoicissus revoilii* Planch.	Vitaceae	Daga-Cebsa (Oro)	C	Fruit	Gambella	3
327	*Rhoicissus tridentata* (L.f.)Wild & Drum-mond	Vitaceae	Qashro (Tig)	C	Fruit	Many parts of Ethiopia	3
328	*Rhus glutinosa* A. Rich.	Anacardiaceae	Letata(D)	T	Fruit	Derashe, Gamo, Zeyise	3
329	*Rhus longipes* Engl.	Anacardiaceae	Ungafree (G)	S	Seed	Derashe and Kucha, Gamo	1, 3
330	*Rhus natalensis* Krauss	Anacardiaceae	Ongaprie (Wel)	T	Fruit	Many parts of Ethiopia	3
331	*Rhus retinorrhoea* Oliv.	Anacardiace	Debeluca (Oro)	T	Fruit	Dheeraa	11

		ae					
332	*Rhus ruspolii* Engl.	Anacardiaceae	Qacawuleteta (D)	S	Seed	Derashe and Kucha, Gamo, Benishangul Gumuz	1,3
333	*Rhus tenuinervis* Engl.	Anacardiaceae	Dadaraiya (G)	S	Fruit	Gamo	3
334	*Rhus vulgaris* Meikle	Anacardiaceae	Kemmo (Oro)	S	Fruit	Kafa, Berta, Hamar and Xonso	3, 10

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
335	*Rhynchosia allaudii* Sacl.	Fabaceae	Holla (Kon)	S	Fruit	Hamar and Xonso	9
336	*Rhynchosia minima* (L.) DC.	Fabaceae	Sharkuma (Ham)	H	Leaves, flower and seed	Hamar and Xonso	9
337	*Ritchiea albersii* Gilg	Capparidaceae	Gabo (Kaf)	S	Fruit	Kafa	3
339	*Rubus aethiopicus* R. A. Grah.	Rosaceae	Hinjaro (Had)	S	Fruit	Many parts of Ethiopia	3
341	*Rubus erlangeri* Engl.	Rosaceae	Henjoriya (Wel)	S	Fruit	Many parts of Ethiopia	3
343	*Rubus volkensii* Engl.	Rosaceae	Yedega Injorii (Amh)	S	Fruit	Many parts of Ethiopia	3

344	*Rumex abyssinicus* Jacq.	Polygonaceae	Sholsholo (Maj)	H	Shoot and root	Many parts of Ethiopia	3
345	*Rumex nervosus* Vahl	Polygonaceae	Abiche (Awi)	S	Leaves, Shoot and Inner part of stem	Awi	3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
346	*Rytigynia neglecta* (Hiern) Robyns	Rubiaceae	Mitto (Oro)	T	Fruit	Goma	4
347	S*aba comorensis* (Boj.) Pichon	Apocynaceae	Goriza (KA)	T	Fruit	Kara and Kwego , Mursi, Gambella	2, 3
348	*Saccharum spontaneum* L.	Poaceae	Maqesha (D)	H	Stem	Derashe and Kucha	1
349	*Sacrocephalus latifolius* (Smith) N. E. Bruce	Rubiaceae	Moyo (Anu)	S	Fruit	Komo	10
350	*Sageretia thea* (Osbeck) M.C. Johnston	Rhamnaceae	Kichil agam (T)	S	Fruit	Alamata	4
351	*Salvadora persica* L.	Salvadoraceae	Mero (Amh)	S	Fruit	Kara, Kwego, Hamar and Xonso	2
352	*Satureja punctata* (Benth.) Briq.	Lamiaceae	Gemuri (Ben)	S	Leaf	Bena, Zeyisse	3
353	*Satyrium aethiopicum* Summerh.	Orchidaceae	Aziburt (Gur)	H	Tuber	Cheha	4
354	*Schinus molle* L.	Anacardiceae	Qundo (Amh)	S	Fruit	Yilmana Densa	4
355	*Schlechterella abyssinica* (Chiov.)	Asclepiadace	Potoro (Ham)	C	Root	Hamar and Xonso	9

	Venter & R. L. Verh.	ae					
356	*Sclerocarya birrea subsp. birrea* (A. Rich.) Hochst.	Anacardiaceae	Pasha (D)	T	Fruit and seed	Derashe, Gamo, Kusue, Mursi, Zeyise, Komo, Majanjir, Nuer	1, 10

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
357	*Scolopia theifolia* Gilg	Flacourtiaceae	Kokofla (Oro)	T	Fruit	Menagesha	3
358	*Scutia myrtina*(Burm. f.) Kurz	Rhamnaceae	Haraang (Oro)	T	Fruit	Dheeraa	11
359	*Senna obtusifolia* (L.) Irwin & Barneby	Fabaceae	Ajada (Anu)	S	Leaf	Anuak, Komo, Nuer	9, 10
360	*Senna occidentalis* (L.) Link	Fabaceae	Senemeki (Oro)	H	Seed	Gambella	3
361	*Senna singueana* (Del.) Lock	Fabaceae	Hanqarar (Kon)	S	Seed	Hamar and Xonso	9
362	*Sida collina* Schlechtend.	Malvaceae	Adik (Anu)	H	Leaves and Young Shoot	Anuak, Nuer	13
363	*Sideroxylon oxyacanthum* Baill.	Sapotaceae	Davesa (Tig)	S	Fruit	Metu	3
364	*Solanum americanum* Miller	Solanaceae	NM	S	Fruit and leaf	Shashamane	7
365	*Solanum memphiticum* Gmel.	Solanaceae	NM	S	Fruit	Shashamane	7

366	*Solanum nigrum* L.	Solanaceae	Tsepo (Kaf)	S	Leaf	Derashe and Kucha, Kara and Kwego, Gu-muz, Kefficho	1, 2, 10
367	*Solanum tarderemotum* Bitter	Solanaceae	NM	S	Fruit and leaf	Dilla	7

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
368	*Sparmannia ricinocarpa* (Eckl. and Zeyh.) O. Ktze.	Tiliaceae	Wulkifa (Amh)	S	Bark	Alamata	4
369	*Sphenostylis stenocarpa* (Hochst. ex A. Rich.) Harms	Fabaceae	Adagora Barracha (Tig)	H	Seed and root	Tigray	3
370	*Sporobolus africanus* (Poir) Robyns and Tournay	Poaceae	Muriye (Amh)	H	Seed	Goma	4
371	*Sporobolus indicus* (L.) R. Br.	Poaceae	Harataa (Oro)	H	Seed	Seqa Choqorsa	6
372	*Sporobolus pyramidalis* P. Beauv.	Poaceae	Girole (G)	H	Seed	Derashe and Kucha, Gamo	1, 3
373	*Sterculia africana* (Lour.) Fiori	Sterculiaceae	Ourae (Ben)	T	Seed	Derashe, Xonso, Kuume	1, 3
374	*Sterculia rhynchocarpa* K. Schum	Sterculiaceae	Qeytso (Ben)	S	Seed	Bena, Tsemay	3
375	*Strychnos innocua* Del.	Loganiaceae	Ugugee (G)	S	Fruit	Derashe and Kucha, Berta	1,13
376	*Strychnos mitis* S. Moore	Loganiaceae	Chatto (She)	T	Fruit	Bale	3

378	*Tagetes minuta* L.	Asteraceae	Zwdearem (Amh)	H	Leaf	Dheeraa	11
379	*Talinum portulacifolium* (Forssk.) Aschers.ex Schwein	Portulacaceae	Dongdongi (Mur)	H	Leaf	Mursi	3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
381	*Tarenna graveolens* (S. Moore) Bremek.	Rubiaceae	Bela (Ham)	S	Fruit	Hamar and Xonso	9, 10
382	*Teclea nobilis* Del.	Rutaceae	Tsaki (Ham)	T	Fruit	Hamar and Xonso	9, 10
383	*Thymus serrulatus* Hochst. ex Benth.	Lamiaceae	Yedega Tosign (Amh)	H	Whole part	Many parts of Ethiopia	3
384	*Toddalia asiatica* (L.) Lam.	Rutaceae	Barbari-Burreed (Som)	S	Fruit	Harar	3
385	*Tribulus terrestris* L.	Zygophyllaceae	Qumputia (Wel)	H	Leaf	North Omo	3
386	*Trichilia dregeana* Sond.	Meliaceae	Gereche (Anu)	T	Seed	Gambella	3
387	*Trilepisium madagascariensis* DC.	Moraceae	Gabo (She)	T	Fruit	Majanjir and Sheko	3, 13
388	*Tristemma mauritanum* J.F. Gmel	Melastomaaceae	Gashgano (Kaf)	S	Fruit	Metu	3

389	*Triumfetta rhomboidea* Jacq.	Tiliaceae	Weeo (Anu)	H	Leaf	Gambella	3
390	*Tropaeolum majus* L.	Tropaeolaceae	NM	H	Fruit	Cheha	4
391	*Tylosema fassoglensis* (Kotschy ex Schweinf.) Torre & Hillc.	Fabaceae	Ballai (Mur)	S	Fruit and seed	Mursi, Hamar and Xonso	3, 9

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
					stem		
393	*Uvaria angolensis* Oliv.	Annonaceae	Boyinya (Wel)	S	Fruit	North Omo	3
394	*Uvaria leptocladon* Oliv.	Annonaceae	Chochum (KW)	T	Fruit	Kara and Kwego	2
395	*Vangueria apiculata* K. Schum.	Rubiaceae	Gurmase (G)	S	Fruit	Derashe and Kucha, Gamo and, Komo	1, 13
396	*Vangueria madagascariensis* Gmel.	Rubiaceae	Mesho (Kaf)	S	Fruit	Xonso	9
397	*Vatovaea pseudolablab* (Harms) Gillett	Fabaceae	Kullayya (Kon)	C	Tuber, Seed, Pod, flower and leaf	Xonso	3, 9
398	*Vepris eugenifolia* (Engl.) Verdoorn	Rutaceae	Tsaki (Ham)	S	Fruit	Hamar and Xonso	9
399	*Vepris glomerata* (F. Hoffm.) Engl.	Rutaceae	Kena (Ham)	C	Fruit	Hamar and Xonso	9
400	*Vigna membranacea* A. Rich.	Fabaceae	Bog Ajowm (Anu)	H	Leaf	Anuak, Berta, Komo	13

401	*Vigna unguiculata* (L.) Walp.	Fabaceae	Shirshira (Kon)	H	Tuber	Xonso	6
402	*Vigna vexillata* (L.) A. Rich.	Fabaceae	Qwruh-Dibela (Tig)	H	Root	Many parts of Ethiopia	3
403	*Vitellaria paradoxa* Gaertn. f.	Sapotaceae	Wado(Anu)	T	Seed and fruit	Gambella	3

No	Scientific name	Family	Local name	Habit	Part used	Where in Ethiopia	Source
404	*Vitex doniana* Sweet	Lamiaceae	Jwelo (Anu)	T	Fruit	Gojam, North Omo, Gumuz	3, 10
405	*Whitfieldia elongata* (P. De Beauv.) De Wild. & T. Durand	Acanthaceae	Adibuch (G)	S	Nectar	Berta	13
407	*Ximenia caffra* Sond.	Olacaceae	Inginkada (Kon)	T	Fruit	Many parts of Ethiopia	3, 10
408	*Zanthoxylum chalybeum* Engl.	Rutaceae	Ketata (K)	T	Seed and Leaf	Derashe and Kucha, Gamo	1
409	*Ziziphus abyssinica* Hochst. ex A. Rich	Rhamnaceae	Lang (Anu)	S	Fruit	Many parts of Ethiopia	3, 13
410	*Ziziphus hamur* Engl.	Rhamnaceae	Haamud (Som)	S	Fruit	Harar	1, 3
411	*Ziziphus mauritiana* Lam.	Rhamnaceae	Gusura (Afa)	T	Fruit	Derashe and Kucha, Afar and Gamo	1, 3
412	*Ziziphus mucronata* Willd.	Rhamnaceae	Kobta (K)	T	Fruit	Derashe and Kucha, Bena, Kusume,	1, 3, 9

						Xonso, Zeyise	