COUNTRY REPORTS

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

Bhutan's Brief National Report on the State of Biodiversity for Food and Agriculture prepared for the Commission on Genetic Resources for Food and Agriculture to the FAO

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STATE OF KNOWLEDGE OF BIODIVERSITY FOR FOOD AND AGRICULTURE

Please consult referenced sections of the country report guidelines[1] for additional information, descriptions and definitions.

I. Assessment and monitoring of biodiversity for food and agriculture

1.1Generalcontext[2]

Bhutan is a small, landlocked country with an area of 38,394 sq.km situated on the southern slope of the Eastern Himalaya, bordering China to its North and India to its south, east and west. The country is almost entirely mountainous with altitudes ranging from 7,500 to 150 masl, within a short north-south distance of 170 kilometres. Straddling the two major Indo-Malayan and Palaearctic biogeographic realms, Bhutan is part of the Eastern Himalayan biodiversity hotpot. Forests constitute the dominant ecosystem in Bhutan, with 70.46 per cent (LCMP, 2010) of the country under forest cover. Due to the variance in the altitudinal range, with corresponding variation in climatic conditions, the country has three distinct eco-floristic zones ranging from Sub-tropical to Alpine zone and six major agro-ecological zones corresponding with different altitudinal ranges and climatic conditions.

The total population of the country is projected at 757,042 in 2015 with Natural Population Growth Rate of 1.3%, based on Population and Housing Census of Bhutan, 2005 (SYB, 2015).

In terms of involvement or participation of population in agriculture sector, the Labor Force Survey (LFS) report, 2013 of the Ministry of Labor and Human Resource (MoLHR), shows that in the last four years (2010-2013), the rate has increased from 56.1 % (52.9 female: 47.1 % male) in 2010 to 62.3 % (54 female: 46 male) in 2012 but has dropped to 53.3 % (56.2 female: 46.7 male) in 2013.

While the country is largely agrarian, with the rapid socio-economic development and the growth of secondary and tertiary sector, the share of contribution from agriculture sector to the national GDP has decreased from 22.57 % in 2005 to 16.18 % in 2013. However, the agriculture sector still continues to be the second largest contributor to the national GDP (RNR Stats 2015).

a) Provide a brief account on the role of biodiversity for food and agriculture in your country.[3]

As an agrarian society with about 69 per cent of Bhutan's population living in rural areas, biodiversity is used for a myriad of purposes ranging from food, fuel-wood, fiber, shelter, medicine, household implements, and handicrafts to several other purposes.

[1]See http://www.fao.org/nr/cgrfa/biodiversity/guidelines/en/.
[2]Reference: questions 2, 3, 4, 5, 6 and 7 of country report guidelines.
[3]Reference: question3 of country report guidelines.

Role of biodiversity for food and agriculture in improving the food and nutrition security as well as livelihoods of the famers can be showcased by the fact that more than 60 species of Non-Wood Forest Products (NWFP) such as edible mushrooms, medicinal plants, wild vegetables, bamboos and canes are currently used through formation of over 99 NWFP management groups in the country (SFED database 2014). The Survey of Edible Wild Plants of Bhutan carried out from 2005 to 2007 records 47 species of wild vegetables alone in the Country (Matsushima et al, 2008). Out of more than 350 species of mushroom known from the country, about 53 are recorded to be edible. The most well-known insect fungus, *Ophicordyceps sinensis,* found in the alpine meadows of the country is a highly valued biological resources due to its medicinal properties. It plays a significant role in uplifting the livelihoods and economic prosperity of alpine dwellers due to its commercial value. In 2014, a total of 671.5kgs of *Ophicordyceps sinensis* were declared of which 554.6 kgs were auctioned and traded, fetching as high as Nu. 1.326 million per kilogram (DAMC, 2014).

Timber is still one of the major raw materials used in construction and for rural energy. In the last five years (2008-2013), about 50 million cubic feet (cft.) of timber has been allotted for commercial and rural purposes, out of which 16 million cft was allocated for firewood as firewood still remains a major source of energy in rural areas with 58.96 per cent of the energy coming from biomass, which is primarily firewood (Dhital, 2009).

b) Indicate which of the production systems listed in Table 1 below are found in your country[4] and briefly describe each of them (e.g. area under production, share of smallholders, importance of the production system to the incomes, livelihoods and well-being of rural communities, etc.).[5]

Table 1.Production systemspresent in the country.

Sector	Code	Production system names	Present (Y/N)
Livestock	L1	Livestock grassland-based systems: Tropics	N
	L2	Livestock grassland-based systems: Sub-tropics	Y
	L3	Livestock grassland-based systems: Temperate	Y
	L4	Livestock grassland-based systems: Highlands	Y
	L5	Livestock landless systems: Tropics	N
	L6	Livestock landless systems: Subtropics	N
	L7	Livestock landless systems: Temperate	N
	L8	Livestock landless systems: Highland	N
Forests	F1	Naturally regenerated forests: Tropics	N
	F2	Naturally regenerated forests: Subtropics	Y

[4]Reference: questions 4 and 5 of country report guidelines. For the purpose of this table, aggregated production systems are used (disregarding climatic zones).
[5]Reference: questions 5 and 7 (Table 3) of country report guidelines and FAOSTAT: http://faostat3.fao.org/home/E

	F 3	Naturally regenerated forests: Temperate	Y
	F4	Naturally regenerated forests: Highlands	Y
	F5	Planted forests: Tropics	N
	F6	Planted forests: Subtropics	Y
	F7	Planted forests: Temperate	Y
	F8	Planted forests: Highlands	N
Aquaculture and Fisheries	A1	Self-recruiting capture fisheries: Tropics	N
	A2	Self-recruiting capture fisheries: Subtropics	Y
	A 3	Self-recruiting capture fisheries: Temperate	N
	A4	Self-recruiting capture fisheries: Highlands	N
	A5	Culture-based fisheries: Tropics	N
	A6	Culture-based fisheries: Subtropics	N
	A7	Culture-based fisheries: Temperate	N
	A8	Culture-based fisheries: Highlands	N
	A9	Fed aquaculture: Tropics	N
	A10	Fed aquaculture: Subtropics	Y
	A11	Fed aquaculture: Temperate	N
	A12	Fed aquaculture: Highlands	N
	A13	Non-fed aquaculture: Tropics	N
	A14	Non-fed aquaculture: Subtropics	N
	A15	Non-fed aquaculture: Temperate	N
	A16	Non-fed aquaculture: Highlands	N
Crops	C1	Irrigated crops (rice) : Tropics	N
	C2	Irrigated crops (rice) : Subtropics	Y
	C3	Irrigated crops (rice) : Temperate	Y
	C4	Irrigated crops (rice) : Highlands	N
	C5	Irrigated crops (other) : Tropics	N
	C6	Irrigated crops (other) : Subtropics	Y
	C7	Irrigated crops (other) : Temperate	Y
	C8	Irrigated crops (other) : Highlands	N
	C9	Rainfed crops : Tropics	N
	C10	Rainfed crops : Subtropics	Y
	C11	Rainfed crops : Temperate	Y
	C12	Rainfed crops : Highlands	Y
Mixed	M1	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Tropics	N
	M2	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics	Y
	M3	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Temperate	Y
	M4	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Highlands	Y
Others	01	Others [*please specify*]	N

Table 2: **Production systems present in the Country**

Code	Production system names	Description
L2	Livestock grassland-based systems: Subtropics	The Sub-tropical grassland-based system is found in the humid and dry subtropical belt of Bhutan where different species of livestock such as cattle, horse sheep goat, poultry, buffalo etc are reared for milk, meat and eggs, draught power for household consumption and sale of surplus produce.
L3	Livestock grassland-based systems: Temperate	The Temperate Livestock grass-land based system in found in the cool temperate and warm temperate belt of Bhutan where different species of livestock such as cattle, horse sheep, goat, poultry, yak are reared for milk, meat and eggs, draught power for household consumption and sale of surplus.
L4	Livestock grassland-based systems: Highlands	The Highland Livestock grassland-based system is found in the cold alpine belt of Bhutan where people rear mainly sheep and yak for milk, meat and draught power for household consumption and sale of surplus.
F2	Naturally regenerated forests: Subtropics	Found in the subtropical belt of the country Altitude: 150-2000 masl (NBSAP, 2014) Forest types: i. Broad leaf forests: 1000-2000 masl, mainly represented by species of *Castanopsis, Lithocarpus, Schima* and *Quercus*. ii. Chir Pine Forest: 700-2000 masl, - Pre stands of Chir Pine (*Pinus roxburghii)* or in association with *Quercus lanata, Quercus griffithii, Quercus glauca* and *Alnus nepalensis* along water courses. iii. Tropical Lowland Forests: <700 masl: Broadly semi-evergreen but varies from almost totally deciduous on exposed dry slopes to evergreen in the moist valleys. Floristic composition consists of tropical species like *Shorea robusta, Terminalia myricarpa, Bombax ceiba, Daubanga grandifolia, Sterculia villosa, Acacia catechu,* and *Terminalia nudiflora.*
F 3	Naturally regenerated forests: Temperate	Found within the altitudinal range of 2000-4000 masl. Forest types: i. Fir Forests: 3000 masl+- either of pure stands of *Abies densa* or mixed with other species such as *Juniperus, Taxus* and *larix* ii. Mixed Conifer Forest- 2500-3500 masl- Mixed stands of spruce, hemlock, juniper, fir, larch, taxus etc and some broad leaf species such as *Quercus semecarpifolia, Populus rotundifolia* and *Rhododendron spp.* iii. Broadleaf mized with Conifer Forest- 2000-25000

		masl- Blue pine mixed with Poplar and other species of *Castanopsis, Quercus, Perses, Litsea, Populus,*etc.
F4	Naturally regenerated forests: Highlands	Found above 4000 masl. Characterized y Alpine meadows and scrubs dominated by Rhododendron scrub, Juniper and herbaceous plants such as *Aconitum, Gentiana, Nardostachys, Delphinium, Rhodiola, Meconopsis, Onosma,Ppicrorhiza, Fritillaria, etc.*
F6	Planted forests: Subtropics	Found within the commercially logged areas in the southern parts of the country.
F7	Planted forests: Temperate	Found within the commercially logged areas and reforested areas after fire.
A2	Self-recruiting capture fisheries: Subtropics	a. Harachhu Capture Fisheries (HCF) - Self- Recruiting Capture Fisheries; Referring to capture fisheries in inland areas that involve *natural ecosystem.* The HCF is a fishery comprising 73 registered household members from 5 villages in and around Adhang geog under Wangduephodrang district. Adhang is one of the remotest geogs under Wangduephodrang district with just over 150 households sparsely scattered over 785 km^2. The entire geog lies along the mountainous ridges at the bottom of which flows the Harachhu River. In the past the community mainly depended on fishery for livelihood (nutrition and income), however, other forms of livelihood options such as agriculture, livestock rearing etc have also been adopted. The fishery has its main objectives to promote: sustainable harvesting and management of fishery resources while also improving nutrition and household income. b. The overriding objective of establishing the self-recruiting capture fishery program at Berti is to enhance the socio-economic status of its populace through sustainable management of available fishery resources. With a male to female ration of 97:86 and an average household size of 9, Berti is home to 183 people spread over 23 households. The average annual household income stands at Nu. 35000. The principal source of livelihood for Berti is agriculture and animal husbandry, with its inhabitants engaged in cultivation of cereal crops such as paddy and maize, and rearing of livestock such as cattle, swine and poultry. Now and then, a few of the inhabitants fish in the two rivers, Bertichhu and Mangdechhu that skirt their village. The fish they catch are eitherconsumed as part of household nutrition or as essentials of religious ceremonies
A10	Fed aquaculture: Subtropics	This includes private aquaculture farms found mostly towards the southern belt of the country rearing fishes in earthen ponds. The main species are the Indian Major Carps (IMC) and the Exotic Carps (EC). Aquaculture is taken up mainly as an additional source of income and livelihood with agriculture and other

		livestock rearing practices as the main form of livelihood. Currently the country has over 500 private farms with the production capacity of 119 MT of fish annually.
C2	Irrigated crops (rice) : Subtropics	Dry Subtropical - 1200 - 1800 masl Humid Subtropical - 600 - 1200 masl Wet Subtropical - 150 - 600 masl
C3	Irrigated crops (rice) : Temperate	Warm Temperate - 1800 - 2600 masl
C6	Irrigated crops (other) : Subtropics	Dry Subtropical - 1200 - 1800 masl Humid Subtropical - 600 - 1200 masl Wet Subtropical - 150 - 600 masl
C7	Irrigated crops (other) : Temperate	Cool Temperate - 2600 - 3600 masl
C10	Rainfed crops : Subtropics	Dry Subtropical - 1200 - 1800 masl Humid Subtropical - 600 - 1200 masl Wet Subtropical - 150 - 600 masl
C11	Rainfed crops : Temperate	Warm Temperate - 1800 - 2600 masl
C12	Rainfed crops : Highlands	Cool Temperate - 2600 - 3600 masl
M2	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Subtropics	Dry Subtropical - 1200 - 1800 masl Humid Subtropical - 600 - 1200 masl Wet Subtropical - 150 - 600 masl
M3	Mixed systems (livestock, crop, forest and /or aquatic and fisheries): Temperate	Warm Temperate - 1800 - 2600 masl
M4	Mixed systems (livestock, crop, forest and /or aquatic and fisheries):Highlands	Cool Temperate - 2600 - 3600 masl

1.2. State, trends and drivers of change of biodiversity for food and agriculture

a) Describe the main features of thestate and trends[6]of and the main drivers of change[7] affecting plant, animal, forest and aquatic genetic resources in the country's

[6]Reference: (i) the First and Second Reports on the *State of the World's Plant Genetic Resources for Food and Agriculture*; the First and Second Reports on the *State of the World's Animal Genetic Resources for Food and Agriculture*; and *The State of the World's Forest Genetic Resources*; and (ii) questions 3, 11, and 20 of country report guidelines.

[7]Reference: (i) the First and Second Reports on the *State of the World's Plant Genetic Resources for Food and Agriculture*; the First and Second Reports on the *State of the World's Animal Genetic Resources for Food and Agriculture*; and *The State of the World's Forest Genetic Resources*; (ii) Annex 3 of the country report guidelines includes a list of drivers of change and descriptions; and (iii) questions 44, 45 and 55 of country report guidelines.

production systemsas identified in Table 1.

Environmental protection, which also includes biodiversity, being one of the four pillars of Gross National Happiness, the developmental philosophy of the country, protection and conservation of all forms and levels of biodiversity are strongly accorded importance in the national developmental plans. However, with rapid socio-economic development, despite strong policies in place for its protection, biodiversity in all forms and level do face threats of decline, loss and extinction.

In the Animal Genetic Resource Sector, the driving forces affecting it negatively are:

- Increasing demand for animal products and effort to increase production which favors particularly high yielding breeds and less emphasis on low yielding breeds.
- Diminishing roles of animal in religious and cultural life.
- Easy access to imported products (meat, fibers) dissuading keeping of animals.
- Farm labor shortages and rural urban migration.

In the Plant Genetic Resource for Food and Agriculture Sector, beside natural calamities such as varied negative impacts of climate change, major anthropogenic factor affecting the conservation and sustainable utilization of Plant Genetic Resources include conversion of agriculture land to other purpose; tendency towards mono cropping with high-yielding and market-oriented cash crops thus displacing genetically diverse landraces; change in food habits and farm labour shortage.

The state of Forest Genetic Resource fares better than others as more than 50 % of the country is under protected area system. There are also other programs such as Forest Protection and Utilization; Forests Resource Development; Social Forestry; Watershed Management and Nature Recreation and Ecotourism which support protection and sustainable utilization of forests genetic resources. Nevertheless, there are both natural and anthropogenic factors impacting the forest genetic resources negatively. The major ones include forest fire (both man-man and natural), conversion of forest land for other purposes; over extraction of timber and fuel wood; wildlife poaching and illegal harvesting of Non-Wood Forest Products and retaliatory killings.

The state of aquatic genetic resources is mostly unknown since the aquatic genetic resources in the country arelargely un-documented. Whatever is known is from few surveys carried out in the recent past. However, besides natural factors such as the impacts of changing climate, disturbance in the river ecosystem due to developmental activities is seen as potential threat to aquatic genetic resources.

b) Indicate whether the country has any national information system in place on associated biodiversity and identify the most frequently monitored components of associated biodiversity.[8]

Bhutan has a web-based Biodiversity Portal which contains information on all taxa of

[8]Reference: questions 28 and 75 of country report guidelines.

biodiversity. However, this portal is still in its early stage of getting populated with data and thus currently has only taxonomic information and citizen-contributed observation data, therefore limiting its use as monitoring tool. However, in the long run as the portal gets populated with observation data, it has the potential to serve as monitoring tool. The Department of Forests and Park Services maintains a closed information system which maintains wildlife surveillance and crime data but its function as monitoring tool for associated biodiversity is limited. The country however has system of monitoring selected species of biodiversity, specifically large mammals such as Tiger, Elephants, wild boar etc and bird species such as Black Necked Cranes and White Bellied Heron through regular surveys.

c) List associated biodiversity species that are actively managed in production systems for the provision of ecosystem services in Table 2.

Table 2. List of associated biodiversity species that are actively managed in production systems for the provision of ecosystem services.[9]

Associated biodiversity species	**Ecosystem functions and services provided by the species in the production system**
Bee species (*Apis cerena, A. mellifera, Trigona spp)*	Honey bee production and pollination in agriculture
Fodder species (*Gautemala* species, *Napier* grass etc)	Natural hazard regulation (Landslide) in Agriculture and Livestock production systems
Earthworm (Vermiculture) and *Sesbania aculaeta* (Nitrogen fixing)	Nutrient cycling in Agriculture production system in small scales
Key stone species (Tiger; Snow Leopard, Elephant)	Habitat provisioning in Forest Ecosystem

d) Provide in Table 3 a list of wild food species known to be harvested, hunted, captured or gathered for food in your country. Indicate 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).

Table 3.Wild food species used for food in the country.[10]

Wild food species	**Change in state (2,1,0,-1,-2, NK)**
Justicia adhatoda L	NK
Plectocomia himalayana Griff.	-1 (based on expert view)
Asparagus racemosa Willd.	-1 (based on expert view)
Thlaspi arvense L.	NK

[9]Reference: question 27 of country report guidelines.
[10]Reference: question 34 of country report guidelines.

Dioscorea alata L.	-1 (Based on expert view)
Dioscorea bulbifera L.	NK
Pogostemon amaranthoides Benth.	NK
Cinnamomum tamala Nees & Ebrem.	NK
Paris polyphylla SM.	-1 (based on expert view as this species is over exploited for export through black-market
Calanthe plantaginea Lindl.	NK
Cymbidium hookerianum Rchb.f.	-1 (Expert view)
Phytolacca acinosa Roxb.	NK
Docynia indica (Wall.) Dcne.	NK
Xanthoxylum armatum D.C	NK
Houttuynia cordata Thunb.	NK
Elatostema lineolatum Wight.	NK
Laportea terminalis Wight.	NK
Urtica dioia L.	NK
Diplazium esculentum (Rets.)Swartz.	NK
Tricholoma matsutake	-1 (Expert view)
Pleurotus cornucopia var. citrinopileatus	NK
Viscum nepalense Prengel.	NK
Tupistra watti Hoof.f.	NK

[Insert rows as needed]

e) If available, provide information on the proportion of the population in your country that uses wild food on a regular basis for food and nutrition.[11]

No information is available on the proportion of population that uses wild food on regular basis. However, out of more than 60 species of wild food (vegetables) and more than 53 edible mushrooms used, the above are the most common ones which are even sold in the city vegetable markets, besides being consumed by collectors. The wild food are mostly collected and consumed by rural population and are main source of micro-nutrients and nutrition.

f) Briefly summarize the state and trends[12]of and the drivers of change[13]affecting: Associated biodiversity[14]: micro-organisms, invertebrates, vertebrates, plants

There is no information on the state and trends of microorganism and invertebrate in the country. Currently, recognizing this information gap, there are few initiatives which are documenting selected groups of invertebrate. However, there is hardly any information on the micro-organisms.

In terms of vertebrates, the country has close to 200 mammals and about 700 birds. Recent

[11]Reference: question 59 of country report guidelines.
[12]Reference: questions 21, 22, 23, 24, 29, 34 and 35 of country report guidelines.
[13]Reference: Annex 3 and questions 9, 10, 12, 14, 44, 45 and 55 of country report guidelines.
[14]Annex 1 of the country report guidelines provides a definition of associated biodiversity.

studies have also documented more than 61 species of amphibians, 124 species of reptiles and 91 species of fresh water fish (NBSAP 2014). However, there are no studies documenting the status and trends.

Bhutan harbors more than 5600 species of wild plants and about 105 are endemic to Bhutan. More than 200 species are collected for use in the formulations in formal traditional medicine as well as by local healers. Although only endemic species have been assessed for their status, there are concerns of over-exploitation/over collection of some species, specifically those used for traditional medicine and thosefetching high market prices such as *Paris polyphylla* and species of *Cymbidium, Dactlorhiza,* etc.

BOX 1. As a countermeasure to reduce the pressure of over-exploitation/collection from wild, the National Biodiversity Centre under the Ministry of Agriculture and Forests has initiated two community-based projects to grow two commonly harvested Orchids used as vegetable, namely: *Cymbidiumerythraeum*and *Cymbidium hookerianum*.

1.3.Needs and priorities

a) **Identify thecountry's main needs and priorities in terms of the state of biodiversity for food and agriculture, and in particular of associated biodiversity, wild foods and ecosystem services.**[15]

Bhutan lacks basic information on the current state of associated biodiversity and wild foods, thus the priority would be to first complete documentation and then design studies and develop system to monitor the state.

In terms of ecosystem service, the priority would be to first understand the key ecosystems services and then devise studies to look at their trends to enable development of strategies for maintaining these key ecosystem services.

These initiatives however need to be complimented with adequate human technical capacity and funding as well as mainstreaming associated biodiversity and ecosystem services into mainstream biodiversity programs.

II. Sustainable use and conservationof biodiversity for food and agriculture

2.1. Sustainable use

a) **List in Table 4 management and diversity based practices that support the maintenance and use of biodiversity for food and agriculture in production systems.**

[15]Reference: questions 28, 48 and 49 of country report guidelines.

Table 4. Management[16] and diversity based[17] practices that support the maintenance and use of biodiversity for food and agriculture in production systems.

Production system	**Management/ diversity based practice[18]**	**Trends in the application of the practice over the past ten years**
Crops	Diversification	Decreasing as more and more commercial varieties are cultivated with focus on few varieties. However, there are few initiatives which are trying to counteract this issue. For example, the National Biodiversity Centre's On-farm conservation program promotes crop diversification, especially through promotion of local crop varieties.
Crops	Base broadening	Decreasing but problem of narrowing genetic base is already realized and small efforts are initiated to counteract this issue.
Crops	Organic Agriculture	Increasing as Organic farming is promoted in the country
Crops	Integrated Pest Management	Increasing
Mixed	Domestication	Increasing as there are initiatives which try to domesticate wild plants used for traditional medicine as well as food.
Forest System	Maintenance or conservation of landscape complexity	Increasing as country has a paid attention to include all types of ecosystems into the designing of protected areas system and Bhutan is increasingly following landscape approach in conservation
Forests and Crops	Restoration practices (Reforestation and Sustainable Land Management Practices)	Increasing: In forest system, more and more degraded areas are getting planted while in agriculture, degraded areas are restored through SLM practices.
Crops	Swidden and shifting cultivation agriculture	Decreasing as shifting cultivation is banned from government reserved forests.

[Insert rows as needed]

[16] Annex 5 of the country report guidelines describes a list of management practices supporting the use and conservation of biodiversity for food and agriculture.
[17] Annex 6 of the country report guidelines describes a list of diversity based interventions supporting the use and conservation of biodiversity for food and agriculture.
[18] Reference: questions 52, 53 and 56 of country report guidelines.

BOX 2.Maintenance or conservation of landscape complexity: Bhutan's protected area system consists of 10 national parks and wildlife sanctuaries encompassing all the major systems/eco-floristic zones found in the country and in order to promote landscape conservation, these parks and wildlife sanctuaries are all connected through biological corridors, putting 51.44% of the country under protected area system.

b) Provideexamples whereby the diversity *per se*,[19] or its lack,[20]had a direct effect on productivity; food security and nutrition; rural livelihoods; ecosystem services; sustainability; resilience; or sustainable intensification.

There are no studies which have looked into the effect of diversity on the above-mentioned services. However, there are incidences of mono-cropping impacting farmer's livelihood. For example, the infestation of citrus orchard by Citrus greening and fruit fly are major concerns as most farmers have converted their traditionally multi-cropped fields into Citrus orchards.

c) List in Table 5 examples wherebythe use of biodiversity for food and agriculture contributed to cope with climate change, invasive alien species, and natural or human-made disasters

Table 5. Examples whereby the useof biodiversity for food and agriculture (BFA)contributed to cope with climate change, invasive alien species, and natural or human-made disasters

Objective	Description
Use of BFA to adapt to and mitigate climate change[21]	- Breeding (Plant variety selection through participatory approach) and promotion of local varieties to adapt to changing climate- promotion of highland local rice variety in rain-fed rice system - Establishment of local seeds community seed banks - On-farm conservation of local/traditional breeds of livestock has potential to cope with changing climate due to natural resilience and potential for genetic improvement.
Use of BFA to manage the spread of/control invasive alien species[22]	No information available
Use of BFA to prevent natural or human-made disasters and/or reduce	Use of plants species (local as well as exotic) for sustainable land management to prevent further erosion

[19]Reference: question 58 of country report guidelines.
[20] Reference: question 57 of country report guidelines.
[21] Reference: question 69 of country report guidelines.
[22]Reference: question 46 of country report guidelines.

their effects on livelihoods, food security and nutrition[23]	of land and landslide

d) List and briefly describe ecosystem/landscape/seascape approaches[24] that have improved the management and use of BFA in the country.[25]

The protected area system of the country encompasses more than 50% of the country's total land and it covers all representative ecosystems of the country. However, there are no studies which have specifically looked into the contribution of protected areas system in improving the management and use of biodiversity for food and agriculture in the country, although in general, it has certainly protected all biodiversity within.

e) Provide examples of activities undertaken to maintain and use traditional knowledge of associated biodiversity and wild foods.[26]

- Documentation of TK associated with biological resources and development of TK database
- Continued use of wild food supports maintenance and use of TK

f) Identify possible needs and priorities in terms of the sustainable use of biodiversity for food and agriculture, and in particular of associated biodiversity and wild foods.

- Complete documentation and inventory of the current state of resource
- Development of strategies for its conservation and sustainable use and mainstreaming into mainstream biodiversity programs.
- Development of sustainable management/utilization plans, specifically of highly used/harvest wild foods and associated biodiversity with economical value.
- Development of technical capacity in survey, documentation, taxonomy and development of sustainable utilization strategies
- Awareness raising and promoting participation from user communities/promote engagement of user communities in designing sustainable utilization strategies.

[23]Reference: question 43 of country report guidelines.

[24]The ecosystem approach concept is generally understood to encompass the management of human activities, based on the best understanding of the ecological interactions and processes, so as to ensure that ecosystems structure and functions are sustained for the benefit of present and future generations. Ecosystem approaches include the Convention on Biological Diversity's Ecosystem Approach, Integrated Land Use Planning, Integrated Water Resource Management, Sustainable Forest Management, Code of Conduct for Responsible Fisheries, Ecosystem approach to fisheries management, etc.
- A "landscape approach" means taking both a geographical and socio-economic approach to managing the land, water and forest resources that form the foundation – the natural capital – for meeting our goals of food security and inclusive green growth. By taking into account the inter-actions between these core elements of natural capital and the ecosystem services they produce, rather than considering them in isolation from one another, we are better able to maximize productivity, improve livelihoods, and reduce negative environmental impacts.

[25]Reference: questions 60, 61 and 80 of country report guidelines.

[26]Reference: questions 32, 33, 38 and 39 of country report guidelines.

2.2. Conservation

a) Describe the status of *in situ* conservation of associated biodiversity and wild food species in your country[27]:

1. List and describe any existing national *in situ* conservation initiative(s).
2. Indicate which species/groups of species are being conserved and with what objective(s).
3. Describe any existing subregional/regional *in situ* conservation initiative(s) the country is involved in.

Except for the following, there is no specific in-situ conservation of associated biodiversity and wild food species in the country.

- 51.44 % of the country under protected areas which accords protection/conservation for all forms of biodiversity
- Two Ramsar Sites designated for protection of wetland and associated species
- Phobjikha Conservation area for protection of habitat for Black-necked cranes and associated biodiversity of Phobjikha high-altitude wetland
- Species conservation program for Tiger, Snow Leopard, white-bellied Heron and Black-necked crane through protection of their habitat.

b) Describe the status of *ex situ* conservation[28] of associated biodiversity and wild food speciesin your country:

1. List and describe any existing national *ex situ* conservation initiative(s).

- ✓ National Crop Gene bank to conserve the seeds of crops as well as wild food and wild crop relatives
- ✓ Field genebank to conserve native fruit trees (Domesticated as well as wild)
- ✓ Botanical garden also has collection of native wild fruit trees and has initiated program to conserve seeds of 100 selected tree species.

c) Indicate which species/groups of species are being conserved and with what objective(s).

- ✓ Wild fruit trees and Crop Wild Relatives are conserved as resource for future crop breeding/improvement.
- ✓ Wild foods and tree seeds are conserved as insurance against total extinction from wild.

d) Describe any existing sub-regional/regional *in situ* conservation initiative(s) the country is involved in.

Bhutan is a part of Kanchenjunga Landscape Conservation and Development Initiative of

[27] Reference: questions 31 (Table 13) and 37 (Table 17) of country report guidelines.
[28] Reference: questions 30 (Table 12) and 36 (Table 16) of country report guidelines.

ICIMOD. This landscape serves as a contiguous habitat for many umbrella and charismatic species including snow leopard (Panthera uncia), red panda (Ailurus fulgens), takin (Budorcas taxicolor), Himalayan black bear (Ursus thibetanus), Himalayan musk deer (Moschus chrysogaster), tiger (Panthera tigris) and Asian elephant (Elephas maximus).This transboundary area also provides valuable ecosystem services that support the wellbeing and livelihoods of people living in the landscape, as well as millions living downstream.

Since 2002, Bhutan has been working closely withSoutheast Asia Regional Initiative for Community Empowerment (SEARICE) in promoting in-situ/on-farm conservation and sustainable utilization of Plant Genetic Resources for Food and Agriculture, through the implementation of projects under Biodiversity Use and Conservation Asia program of SEARICE.

e) Identify possible needs and priorities in terms of the conservation of biodiversity for food and agriculture, and in particular of associated biodiversity and wild food species.

- Complete documentation and inventory, including current resource status of lesser known groups of associated biodiversity and wild food species
- Development of strategies for conservation and sustainable use, including strengthening in-situ conservation through declaration of additional protected areas/special sites based on assessment (if the sites do not fall within the current protected area system)
- Increasing awareness on the role of associated biodiversity and wild food species as part of ecosystem functioning and food and nutrition security, respectively.
- Promote research in wild food species and associated biodiversity
- Awareness raising and promoting participation from user communities/promote engagement of local communities conservation

2.3.Access and exchange[29]

Bhutan has Interim Access and Benefit Sharing (ABS) Policy which is in line with the Nagoya Protocol and ITPGRA. Bhutan is also in the process of revising its Biodiversity Act 2003 in line with ABS policy. Prior Informed Consent (PIC) and fair and equitable sharing of benefits arising from the use of genetic resources are the core principles of both the policy and the Act. The ABS Policy and Biodiversity Act of Bhutan defines "Access to genetic resources" as collection or transfer of genetic resources from Bhutan for research or commercial purposes or both irrespective of whether they are found in situ or ex situ and the access regulation is applicable to all genetic resources which is defined as "all plant, animal and micro-organism or parts thereof, their genetic material and by products with actual or potential use or value but excluding value added products". Both the legislation also have special provisions in line with the ITPGRA to address access and use of Annex I crops of ITPGRFA.

[29]Reference: questions 72 and 73 of country report guidelines.

a) Describe in Table 6 the main measures in the country (i) regulating access to; and (ii) ensuring the fair and equitable sharing of benefits arising from the utilization of biodiversity for food and agriculture (BFA).

Table 6. Description of the main measures in the country (i) regulating access to;and (ii) ensuring the fair and equitable sharing of benefits arising from the utilization of biodiversity for food and agriculture (BFA).[30]

Access to genetic resourcesand fair and equitable sharing of benefits arising from the use will be governed by the Biodiversity Act of Bhutan, which is in line with the provisions Nagoya Protocol.

However, access to duly registered *ex situ* collections of Plant Genetic Resources for Food and Agricultureunder Annex-1 of the International Treaty on Plant Genetic Resources for Food and Agriculture, specifically for food and feed purposes has special provision under the Act which isin accordance with the terms and conditions of the Multilateral System of Access and Benefit-sharing of the Treaty.

Components of BFA	**Description of measures governing access to BFA**	**Description of measures regulating the fair and equitable sharing of benefits arising from the utilizationof BFA**
Genetic resources		
PGRFA	As per the Biodiversity Act of Bhutan which is aligned to Nagoya Protocol, access to BFA has to be routed through the designated National Focal Point through submission of access proposal and may be obtained through one of the following procedures: i. Scoping Agreement followed by an Access and Benefit Sharing Agreement; ii. Access and Benefit Sharing Agreement; iii. Material Transfer Agreement; or iv. Standard Material Transfer Agreement for duly registered	As per the Biodiversity Act of Bhutan which is aligned to Nagoya Protocol and ITPGRA. Fair and equitable sharing of benefits from commercial use of genetic resources is the key component of a Scoping Agreement or Access and Benefit Sharing Agreement which will be based on mutually agreed terms between the provider and assessor of the genetic resources. The National Focal Point shall negotiate and provide oversight to ensure fair and equitable sharing of benefits arising from research and commercial utilization of genetic resources and associated

[30]Measures facilitating access to the different components of biodiversity for food and agriculture usually vary according to the intended use of the resource (e.g. any use, research and development, commercial use). Examples of possible measures consist of the need to obtain prior informed consent (PIC), sharing benefits based on mutually agreed terms (MAT), having special considerations in place for access to resources held by indigenous peoples and local communities, etc.

	ex-situ collections of Annex 1 crops under ITPGRA. With regards to Prior Informed Consent, the National Focal Point shall before entering into Scoping Agreement or Access and Benefit Sharing Agreement seek Prior Informed Consent of the providers of genetic resources or holders of associatedtraditional knowledge as prescribed in the Regulations.	traditional knowledge
AnGR	,,	,,
FGR	,,	,,
AqGR	,,	,,
Associated biodiversity		,,
Micro-organisms	,,	,,
Invertebrates	,,	,,
Vertebrates	,,	,,
Plants	,,	,,
Wild foods	,,	,,

[Insert rows as needed]

b) Identify possible needs and priorities in terms of the policies and regulations governing the access to and ensuring the fair and equitable sharing of benefits arising from the utilization of biodiversity for food and agriculture, and in particular of associated biodiversity.

The ABS policy and the Biodiversity Act covers all components of biodiversity and thus has the provisions addressing all issues of PIC, fair and equitable sharing of benefits as well as conservation. However, there is a need for strengthening capacity in the implementation of the legislation and establishment of institutional set-up as well as awareness-raising of ABS legislation.

III. Policies, institutions and capacity

3.1.Policies, programmes, institutions and other stakeholders

a) Describerelevantpolicies and programmes the country has adopted and is implementingto support the conservation and sustainable use of biodiversity for food and agriculture, and specify to which extent they address associated biodiversity and

wild foods.[31]Relevant policies and programmes are those that aim at:

- the coordinateduse and conservationof sectoral genetic resources
- addressing food security and nutrition[32]
- the sustainable use and conservation of associated biodiversity
- the maintenance of ecosystem services
- improving resilience and sustainability of production systems
- supporting farmers, livestock keepers, forest dwellers and fisher folk to adopt and maintain practices that strengthen the conservation and use of biodiversity for food and agriculture
- the application of an ecosystem/landscape/seascape approach[33]

The Constitution of the Kingdom of Bhutan 2008 decrees that the country maintain minimum of 60 per cent of the total land under forest cover for all time. Article 5.1 of the Constitution states that: "*Every Bhutanese is a trustee of the Kingdom's natural resources and environment".* The government is tasked to conserve and improve the environment and safeguard the country's biodiversity. It is further directed to secure sustainable development while promoting economic and social development.

While there is no specific policy addressing associated biodiversity and wild food plants *per se,* Bhutan has a host of policies and regulations to safeguard the environment and promote conservation and sustainable use of biodiversity in general as summarised below:

The **Food and Nutrition Security Policy of Bhutan, 2014,** amongst others, promotes biodiversity conservation for food security and resilience.

The National Forest Policy, 2011 ensures that Bhutan's forest resources and biodiversity are managed sustainably to provide a wide range of social, economic and environmental benefits while still maintaining the constitutional requirement of a minimum of 60 per cent of the country's total land area under forest cover.

The **Biosecurity Policy of the Kingdom of Bhutan 2010** ensures the protection of the Bhutanese people and Bhutan's biodiversity from the harmful effects of pests and diseases, invasive alien species, genetically modified organisms, toxic chemicals and food additives.

The **National Environment Protection Act (NEPA) 2007** provides for the establishment of an effective system to conserve and protect the environment through the National Environment Commission or its successors, designation of competent authorities and constitution of other advisory committees, so as to independently regulate and promote sustainable development in an equitable manner. The Act calls for the conservation of natural resources to be based on a participatory approach aimed at achieving an equitable sharing of the costs and benefits of

[31]Reference: questions 66, 67 and 78 of country report guidelines; Policies and programmes can include incentives or benefits, such as payments, provision of inputs and subsidies, to support activities for the conservation and sustainable use of biodiversity for food and agriculture.

[32]The relevant policies and programmes should have an explicit reference to associated biodiversity and/or wild foods.

[33]Reference: question 67 of country report guidelines.

conservation among resources users.The Act also calls for conservation and protection of wetlands, alpine regions, watersheds, and other vulnerable ecosystems in addition to the existing protected areas.

The Biodiversity Act of Bhutan 2003 provides for the conservation and sustainable utilization of biological resources and associated traditional knowledge. It also authorizes the implementation of the Access and Benefit-sharing regime to derive additional benefits in a fair and equitable manner.

The **Seeds Act of Bhutan 2000** regulates the import and export of agriculture seeds and prevents introduction of unwanted plants and diseases. It also promotes the seed industry with the aim to enhance rural income and livelihood.

The **Pesticide Act of Bhutan, 2000** encourages the practice of organic agriculture and integrated pest management with a centralized system that controls and limits the import, sale and use of pesticides.

The **Forest and Nature Conservation Act of Bhutan 1995** covers forest management, prohibitions and concessions in State Forests, forestry leases, social and community forestry, transport and trade of forestry produce, protected areas, wildlife conservation, soil and water conservation, and forest fire prevention.

The **Plant Quarantine Act 1993** was enacted to prevent the introduction of pests not already present or widespread in the country; control those pests already present by restricting their spread and by endeavoring to eradicate them; provide facilities for services for import of plants and plant products; and extend cooperation in the prevention or movement of pests in international trade and traffic.

Institutions/Programs in place to support the conservation and sustainable use of biodiversity for food and agriculture:

The **Ministry of Agriculture and Forests** is the central organization for the formulation and implementation of polices and legal frameworks related to biodiversity, forests, livestock and agriculture. The following Departments and Central agencies of the Ministry implement various biodiversity programs.

The **National Biodiversity Centre** is mandated tocoordinate the implementation of biodiversity conservation and sustainable utilization programs in the country, and specifically the objectives of the Convention on Biological Diversity. Currently, the Centre has the following technical programs to implement its mandates:

a. Agro-biodiversity conservation program which address both ex-situ and On-farm Conservation of both Plant and Animal Genetic Resources for food and agriculture
b. Botanical collection program: It manages the national herbarium and a botanical garden with mandates for conservation of native flora, including native flora with economic value such as wild fruit trees.

c. Bioprospecting and Research program, amongst others regulates access to genetic resources and traditional knowledge associated with Genetic resources as per the provisions of the Biodiversity Act of Bhutan and in line with the principles of Nagoya Protocol.
d. Biodiversity Information Management program hosts and manages the web-based biodiversity information system of the country.

The **Department of Forests and Park Services** is the overall authority for the management of forest resources and wild biodiversity. It is responsible for *in situ* conservation of wild biodiversity through creation and management of protected area system; protection and management of forest and wildlife resources; and education and public awareness.

The **Department of Agriculture** is mandated to enhance food security and income through improved management of field crops, horticulture crops and medicinal plants. Access to markets, farm inputs, construction of farm roads, selection of improved technologies and sustainable land management; and integrated pest management are some of the means identified to achieve its mandates and national goals.

The **Department of Livestock** is responsible for coordination, administration and management of services related to livestock production, livestock input supply and livestock health. It works towards attaining food-security and self-sufficiency in livestock products by ensuring prompt delivery of appropriate technologies and services.

The **Bhutan Agriculture and Food Regulatory Authority** regulates the trade of restricted biological resources and its parts and prevents the introduction of pest, diseases and Invasive Alien Species, including Genetically Modified Organisms. It also ensures safety of food and food products in the country for public health.

Apart from the Ministry of Agriculture and Forests, the other key stakeholders are involved in promotion of conservation and sustainable utilization of biodiversity are::

The **National Environment Commission (NEC),** chaired by the Prime Minister and composed of high-level multi-sectorial representatives is an independent authority and the highest decision-making body on all matters related to the environment and its management in the country.

The **Local Administration** (Dzongkhag or Gewog) is cross-sectorial and consists of government and locally elected representatives responsible for planning and implementation of plans and programs at the local level. They play an instrumental role in biodiversity conservation and sustainable utilization programs and disseminating related information to the local communities.

The **Royal Society for Protection of Nature** (RSPN) is a registered Public Benefit Organization (PBO) under the Civil Society Organization (CSO) Authority of Bhutan. Since 1987, RSPN has been engaged in environmental conservation through environmental education and advocacy, conservation of natural resources and sustainable livelihoods. It also focuses on research and emerging issues such as climate change, solid waste and water management.

The **Bhutan Trust Fund for Environmental Conservation** is an independent grant making Organization. It uses its annual investment income of US$ 1.5 – 1.8 million to finance field programs for biodiversity/environmental conservation and the promotion of social welfare in the country.

b) Provide a short analysis of the strengths and weaknesses of the policies and programmes mentioned above and indicate their level of implementation.[34]

Bhutan has over 12 Acts, polices and strategies supporting biodiversity conservation in general. This indicates strong policy support for biodiversity conservation and sustainable use. However, one of the main issues in terms of policies includes strengthening coherence and synergies among the existing policies and Acts. Strengthening the implementation of various policies and programs has also been repeatedly identified as one of the areas to be addressed.

c) Provide examples of successful interministerial cooperation in the area of conservation and sustainable use of biodiversity for food and agriculture and describe the relevant collaboration mechanisms.[35]

The National Environment Commission, chaired by the Prime Minister is a high level multi-sectoral body. It is the highest decision making and coordinating body on all the matters relating to the protection, conservation and improvement of the natural environment, which includes biodiversity. The members of the commission are either Minister or Secretaries or other heads of the agencies from Ministry of Works and Human Settlement, Ministry of Education, Ministry of Agriculture and Forests, Ministry of Economic Affairs as well as from Academia and environmental NGO.

The revision of NBSAP was undertaken through a collaborative process engaging both traditional as well as non-traditional biodiversity sectors. The proposed implementation modality of NBSAP also has identified non-biodiversity sectors as key partners in implementing the biodiversity targets, for example, engagement of education sector in achievement of Target 1 of the NBSAP (Education and awareness) and Ministry of Finance and Planning agencies for target 20 (Resource Mobilization).

Of recent, the Biodiversity Financing (BIOFIN) Project which aims to address financing of biodiversity programs in the country has also established a multi-sectorial committee with representatives from non-traditional biodiversity sectors such as Ministry of Finance and Planning Commission leading the process.

The Scientific/Technical Review Committee which guides the implementation of Access and Benefit Sharing regime in the country also has members from trade and health (Traditional medicine) sector.

[34] Reference: questions 66 and 67 of country report guidelines.
[35] Reference: questions 81 and 82 of country report guidelines.

d) Identify possible needs and priorities in terms of policies, programmes and institutions governing biodiversity for food and agriculture, and in particular associated biodiversity and wild food species.[36]

Policy:

- Strengthening synergy of the existing policies
- Highlighting associated biodiversity and wild food species into the general biodiversity policies
- Awareness raising on the existing policies and capacity development for implementation

Programmes:

- Strengthening programs on associated biodiversity and wild food
- Mainstreaming associated biodiversity and wild food programs into mainstream biodiversity programs

Institutions:

- Mandating existing organization working on general biodiversity to address associated biodiversity and wild food plants
- Improving coordination between existing biodiversity institutions
- Developing capacity of the institutions in terms of man power as well as technical capacity to address associated biodiversity and wild food as well.

3.2. Capacity

a) Identify and prioritize training and educationneeds that target the conservation and sustainable use of associated biodiversity and describe possible constraints.[37]

One of the first and key steps in promoting the conservation and sustainable use of associated biodiversity is to understand the status of existing diversity and resource. Therefore, development of expertise in taxonomy, resource inventory and mapping, valuation of associated biodiversity in terms of monetary as well as non-monetary value and development of sustainable management strategiesare the basic requirements. These could be done through incorporation of the subject matters in university education curricula or development of specialized courses for professionals already working in the general biodiversity field. Targeted awareness-raising on the value of associated biodiversity is yet another field which needs to be addressed.

Some of the possible constraints foreseen are over-stretching of the university curricula, lack of takers for course/training as well as lack of in-country capacity/expertise in providing such course.

[36] Reference: question 88of country report guidelines.
[37] Reference: questions 85, 86 and 90 of country report guidelines.

b) Identify and prioritize research needs to strengthen the conservation and sustainable use of associated biodiversity, wild foods and ecosystem services and describe possible constraints.[38]

Research needs:

- Mainstreaming research on associate biodiversity into mainstream biodiversity research programs
- Inventory and mapping of associated biodiversity and their status (current baseline information)
- Research on the role of associated biodiversity in general ecosystem services as well as food security and livelihood.
- Research on management, including sustainable use as there is hardly any information available on the management and sustainable use of associated biodiversity and wild food.

IV. Regional cooperation

4.1 Regional initiatives the country is involved in to conserve and use biodiversity for food and agriculture

a) Describe in Table 7 relevant regional policies and programmes embedding the conservation and/or use of biodiversity for food and agriculture, and in particular associated biodiversity, wild food species and ecosystem services.

Table 7. Description of relevant regional policies and programmes that embed the conservation and/or use of biodiversity for food and agriculture, and in particular associated biodiversity, wild food species and ecosystem services.[39]

Regional policies and programmes	Description
Kangchenjunga Landscape Conservation and Development Initiative	The Kangchenjunga Landscape Conservation and Development Initiative (KLCDI) is a transboundary conservation and development programme jointly implemented by the government of Bhutan, India and Nepal which is facilitated and supported by the International Centre for Integrated Mountain Development (ICIMOD). The initiative emphasizes the transboundary landscape approach advocated and promoted by the Convention on Biological Diversity, which recognises the importance of establishing habitat linkages among the protected areas, managing the ecosystems in entirety, and supporting the livelihoods of

[38] Reference: questions 87 and 91 of country report guidelines.
[39] Reference: question 84 of country report guidelines.

	communities living in the KL.
South Asia Wildlife Enforcement Network (SAWEN)	South Asia Wildlife Enforcement Network (SAWEN) is an inter-governmental wildlife law enforcement support body of South Asian countries namely - Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. It promotes regional cooperation to combat wildlife crime in South Asia with focus on policy harmonization; institutional capacity strengthening through knowledge and intelligence sharing; and collaboration with regional and international partners to enhance wildlife law enforcement in the member countries.
Asia Pacific Association of Forests Research Institutions (APAFRI)	Bhutan is also a member of APAFRI which enhance research and technology development capabilities in support of conservation and management of forest resources in the Asia-Pacific region
Global Tiger Initiative (GTI)	Bhutan being one of the tiger range countries is also a member of the Global Tiger Initiative (GTI)- a global alliance of governments, international organizations, civil society, the conservation and scientific community, and the private sector committed to working together toward a common agenda to save wild tigers from extinction.
Biodiversity Use and Conservation Asia Program through Southeast Asia Regional Initiatives for Community Empowerment (SEARICE)	SEARICE is a regional non-government organization that promotes and implements community-based conservation, development and sustainable use of plant genetic resources in partnership with civil society organizations, government agencies, academic research institutions and local government units in Bhutan, Lao PDR, the Philippines, Thailand, Vietnam and Cambodia. Through the support of SEARICE, Bhutan implements Biodiversity Use and Conservation in Asia Programme that aim to strengthen the capacity of farmers to manage their PGR and secure their local seed systems through conservation, crop improvement and sustainable utilization.

In addition to the above regional programs and cooperation related to biodiversity, Bhutan is also a member of the following biodiversity related international bodies:

- The UN Convention on Biological Diversity (UNCDB)
- The UN Convention to Combat Desertification (UNCCD)
- Food and Agriculture Organization of the UN
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- RAMSAR Convention on Wetlands
- UNESCO World Heritage Convention

- The Nagoya Protocol Access to Genetic Resources and Equitable Sharing of Benefits Arising from their Utilization to the CBD
- The Categena Protocol on Biosafety to the UN CBD
- International Plant Protection Convention
- International Treaty on Plant Genetic Resources for Food and Agriculture

4.2.Needs and priorities

a) Identify possible needs and priorities in terms of embedding biodiversity for food and agriculture, and in particular associated biodiversity, wild foods and ecosystem services into regional and international initiatives.

- Strengthen dialogue among various regional and international initiatives through establishment of working groups/committee
- Strengthen synergy in the implementation of programs under various regional and international initiatives.
- Highlight/create awareness on associated biodiversity in the regional and international biodiversity initiatives.

V. Synthesis of needs and priorities and the possible way forward

Countries may wish to use Table 8 to summarize their needs and priorities, and possible actions to be undertaken, with respect to the four priority areasof the guidelines.[40]

Table8. List of the country's needsand priorities, and possible actions to be undertaken,to conserve and use biodiversity for food and agriculture

Priority areas	Needs and priorities	Possible actions to be undertaken[41]
1. Assessment and monitoring	Complete documentation of associated biodiversity and wild food plants	Systematic survey and Inventory; Mainstream survey and inventory of associated biodiversity into existing biodiversity programs; Develop technical capacity in taxonomy and survey
	Institutionalize Monitoring Mechanism	Design studies and develop Monitoring system
	Identification of key Ecosystem services and prioritization for monitoring	Undertake studies to identify key ecosystems services and ecosystems at risk; Design and institute monitoring mechanism
2. Conservation	Develop/strengthen conservation and	• Increase awareness on the role of

[40]See sections 1.3 (a), 2.1 (f), 2.2 (c), 2.3 (b), 3.1 (d), 3.2, 4.2 (a) of the present guidelines.
[41]Reference: questions92, 93, 94, 95, 96 and 97 of country report guidelines.

and sustainable use	sustainable use strategies of associated biodiversity and mainstream into mainstream biodiversity programs	associated biodiversity and wild food species as part of ecosystem functioning and food and nutrition security, respectively. • Promote research in wild food species and associated biodiversity • Development of technical capacity in developing management strategies for associated biodiversity
	Promote/mainstream associated biodiversity into mainstream biodiversity programs	• Identification of agencies to lead research and programs on conservation and sustainable use of associated biodiversity
3. Policies, institutions and capacity	**POLICY** • Strengthen synergy of the existing policies • Highlight associated biodiversity and wild food species into the general biodiversity policies • Awareness raising on the existing policies and capacity development for implementation	• Review of existing biodiversity policies • Address gaps by developing and incorporating policies related to associated biodiversity into the mainstream biodiversity policy
	INSTITUITIONS • Mandating existing organization working on general biodiversity to address associated biodiversity and wild food plants • Improving coordination between existing biodiversity institutions • Developing capacity of the institutions in terms of man power as well as technical capacity to address associated biodiversity and wild food as well.	• Review of the mandates and program of work of the existing biodiversity institutions • Identification of lead/coordinating agencies to lead/coordinate programs on associated biodiversity • Capacity gap analysis of the biodiversity institutions to address associate biodiversity and develop required capacity
	CAPACITY • Promote research on associated biodiversity, wild food and ecosystem services • Strengthen research capacity on associated biodiversity, wild food and ecosystem services	• Develop research and capacity development strategy and plan • Funding support for researchers and capacity development of biodiversity professionals

4. Regional and international cooperation	• Strengthen dialogue among various regional and international initiatives • Strengthen synergy in the implementation of programs under various regional and international initiatives. • Highlight/create awareness on associated biodiversity in the regional and international biodiversity initiatives	• Establishment of working groups/committee with representatives from various initiatives • Development and implementation of Multi-targeted/joint projects • Development and implementation of targeted awareness-raising initiatives

VI. Reference

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iii. *LCMP (2010):* Bhutan Land Cover Assessment, 2010: *Technical Report, Bhutan Land Cover Assessment*, National Soil Services Centre (NSSC) & Policy and Planning Division (PPD), MoAF, RGoB.

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vi. *RNR Stats (2015): Bhutan RNR Statistics 2015.* RNR Statistical Coordination Section, PPD, MoAF, RGOB.

vii. *SYB (2015):* Statistical Yearbook of Bhutan (SYB), (2015). National Statistics Bureau, RGoB, Thimphu.

APPENDIX 1

Figure 1. Recommended scope of *The State of the World's Biodiversity for Food and Agriculture*.

	Ecosystem services	
	Mainly provisioning	**Mainly supporting and regulating**
Biological resources	Food and non-food products provided by cultivated and wild species and genetic resources of plants, animals (vertebrate and invertebrate), aquatic resources and micro-organisms. Examples include trees (timber, fuelwood), crops (food, feed, fodder and dye), livestock (meat, eggs, hides, fur skins and fibre), fish, wild plants (food, medicine), wild relatives, edible fungi, edible insects, bush meat, crustaceans and mollusks (pearls).	Associated biodiversity: species and genetic resources directly involved in supporting and regulating production systems. Examples include soil and planktonic microbes, pollinators, symbionts and kelp forests.
Relevant CGRFA assessments	Plant genetic resources: First and Second Reports on the *State of the World's Plant Genetic Resources for Food and Agriculture* Animal genetic resources: First and Second Reports on the *State of the World's Animal Genetic Resources for Food and Agriculture* Forest genetic resources: *The State of the World's Forest Genetic Resources* Aquatic genetic resources: *The State of the World's Aquatic Genetic Resources for Food and Agriculture* (expected 2017)	***The State of the World's Biodiversity for Food and Agriculture*** **(expected 2017)**
Note: The scope of ***The State of the World's Biodiversity for Food and Agriculture*** includes interactions between plant, animal, forest and/or aquatic genetic resources, ecosystem services (mainly supporting and regulating), associated biodiversity and wild foods.		